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EDWARDS (F. W.). **On three European Species of** *Simulium*.—*Ann. naturh. Mus. Wien* **46** pp. 255–256. Vienna, 1933.

The author discusses the synonymy of *Simulium bezzii*, Corti (*tristrigatum*, End., *vittatum* var. *delphinense*, Villen.) and *S. rufipes*, Mg. (*gallii*, Edw., *fulvipes*, Edw.), which latter he regards as the representative in central and southern Europe of *S. hirtipes*, Fries (*nigripes*, End.), and describes *S. xanthinum*, sp. n., from Andalusia, Spain.

LANGERON (M.). **Précis de microscopie—technique—expérimentation—diagnostic.**—5th revd edn, Cr. 8vo, xx+1205 pp., 366 figs. Paris, Masson et Cie, 1934. Price *Fr.*100.

The completely revised 5th edition of this work includes a chapter devoted to Arthropods, which, in addition to dealing with the ordinary technique of microscopy, gives detailed instructions for the breeding and feeding of various blood-sucking insects.

COUSIN (G.). **Etude biologique d'un chalcidien :** *Mormoniella vitripennis* **Walk.**—*Bull. biol. Fr. Belg.* **67** no. 3 pp. 371–400, 8 figs., 3 pp. refs. Paris, 1933.

An account is given of the bionomics of the Pteromalid, *Mormoniella vitripennis*, Wlk. (*Nasonia brevicornis*, Ashm.), a widely distributed and very common parasite of the pupae of many Muscoid flies, including observations made by the author on a strain from eastern France reared in the laboratory over a period of 9 years on *Calliphora erythrocephala*, Mg., and *Lucilia sericata*, Mg., and more recently on *L. bufonivora*, Mon. Although adult parasites emerged in puparia of *Sarcophaga carnaria*, L., they were unable to make their way out, probably owing to the thickness of the chitin. Emergence is also prevented if puparia of *Lucilia* are left in a humid medium, so that their chitin becomes soft. No eggs were laid in larvae of *L. sericata*, and as these were immobile (either in a state of diapause or about to pupate),

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this must be attributed to their lack of attraction for the ovipositing females rather than to their activity [*cf. R.A.E.*, B **3** 16]. The eggs are deposited beneath the internal wall of the puparium on the surface of the pupa, to which they adhere in groups of three or more. The larvae perforate the pupal tegument and absorb the tissues of the host, living as ectoparasites throughout their period of development. They excrete once only, immediately before pupation. The rate of development under favourable conditions is directly related to temperature ; at 30°C. [86°F.], the life-cycle from egg to adult occupies 10 days. The number that can develop in a single host is very variable, but the optimum conditions of nourishment obtain when there are not more than 10–12 parasites of about the same age. When many eggs are laid on a single host, the larvae pupate without reaching their normal size and the resulting adults are small ; the maximum number of parasites obtained under these conditions was 53 [*cf.* **8** 218]. Occasionally, when only a single egg is deposited on the host, both the parasite and the fly emerge. The larvae pupate within the host puparium, and the adults emerge through holes cut in it, many often emerging through the same hole. Sexual dimorphism and musculature are discussed. Pairing takes place after emergence from the puparium ; females removed artificially give rise to males only. Towards the end of its life, a female fertilised on emergence often gives rise to males only unless a second pairing has taken place. Both males and females were observed to feed on the juices from the host at the site of punctures made by the ovipositor of the female parasite, but the males are sexually mature on emergence, and though most of the females feed before ovipositing [*cf.* **5** 158], some 10–15 per cent. begin to oviposit a few hours after emergence. At laboratory temperatures (18–20°C. [64·4–68°F.]), the majority of males live 5–7 days and of females 20–25. Eggs are deposited at any point on pupae of any age, the average number laid daily being 15–17. The proportion of males to females among the progeny of fertilised females kept with males was about 1 : 8–10.

BRUMPT (E.). **Transmission de la fièvre pourprée des Montagnes rocheuses par la tique américaine** *Amblyomma cayennense.*—*C. R. Soc. Biol.* **114** no. 31 pp. 416–419, 1 ref. Paris, 1933.

The author describes experiments carried out in Paris in 1933 in which Rocky Mountain spotted fever was transmitted by *Amblyomma cayennense*, F. [*cf. R.A.E.*, B **21** 243]. His results constitute additional evidence that São Paulo exanthematic typhus is closely related to, if not identical with, Rocky Mountain spotted fever [*cf.* **21** 276, etc.]. He discusses the possible origin of the disease and, in view of the abundance of *A. cayennense* in São Paulo, comments on the relative scarcity of cases [**21** 67, 68].

DE BOISSEZON (P.). **De l'utilisation des protéines et du fer d'origine végétale dans la maturation des oeufs chez** *Culex pipiens* **L.**—*C. R. Soc. Biol.* **114** no. 31 pp. 487–489, 3 refs. Paris, 1933.

Although it has been found that larvae of *Culex pipiens*, L., reared on a medium containing pulverised cooked blood regularly give rise to females capable of ovipositing without a blood meal [*R.A.E.*, B **18** 94], media containing proteins of animal origin are not suitable for all mosquitos, and attempts to use them for rearing larvae of *Theobaldia*

annulata, Schrank, or of a strain of *C. pipiens* obtained from a rural area in France were unsuccessful. In order to obtain females of this strain that would oviposit without a blood meal, vegetable media for rearing the larvae were then tested. A medium consisting of powdered dried leaves soaked in water was unsatisfactory, but by using one made from cooked dried lentils (the preparation of which is described) seven generations were reared between September 1932 and May 1933, without any nourishment being taken by the adults. Chemical analysis of the lentils showed that they contain about the same percentage (0·5) of iron as the haemoglobin of the blood of mammals, whereas in the powdered dried leaves not only is the carbohydrate content much less, but the proportion of iron in the ash is only 0·2 per cent. Iron exists in considerable quantity in the vitellus of mosquito eggs. It is formed, in the course of the maturation of the eggs, from the haemoglobin absorbed by the adult female during a blood meal or, as the author has shown, it is carried over from the larva in the course of the pupal stage with the other reserves of fats and albumin by the cells of the fat-body, a process that explains the histochemical mechanism of ovipositions without blood meals.

HECHT (O.). **Die Blutnahrung, die Erzeugung der Eier und die Ueberwinterung der Stechmückenweibchen.** [The Blood-nutrition, Egg-production and Hibernation of Female Mosquitos.]—*Beih. Arch. Schiffs- u. Tropenhyg.* **37** no. 3 pp. 125–211, 1 fig., 6 pp. refs. Leipzig, J. A. Barth, 1933. Price *Rm.* 5.

This is a valuable survey of published data on the following aspects of the physiology of mosquitos: Blood-nutrition, including a note on the food-preferences of races of *Anopheles maculipennis*, Mg.; egg-production and the influence on it of blood-meals, larval nutrition, temperature and mating; hibernation of the females (especially those of *A. maculipennis*, including the question of races and the formation of the fat-body); and survival of tropical species through the dry season.

NITZULESCU (G.) & NITZULESCU (V.). **Présence de** *Phlebotomus* (*Larroussius*) *macedonicus* **en Italie.**—*Ann. Parasit. hum. comp.* **11** no. 6 pp. 425–441, 14 figs., 9 refs. Paris, 1st November 1933.

Descriptions are given of both sexes of a sandfly taken by G. Franchini in and near Modena, Italy. A male of the same species taken in Salonica was found in Brumpt's collection, and a comparison with the description of *Phlebotomus macedonicus*, Adl. & Thdr. [*R.A.E.*, B **19** 218], which the authors consider inadequate, suggests that the two species are identical. The female described by Adler and Theodor as *P. macedonicus* does not appear to belong to this species. *P. perniciosus* var. *nitzulescui*, Simić [**20** 228] is also apparently identical with *P. macedonicus*; in any case, it is undoubtedly specifically distinct from *P. perniciosus*, Newst., and the name is preoccupied by *P. nitzulescui*, Lima [**20** 161].

Franchini states that *P. macedonicus* is abundant at Modena and Bologna from April to the end of September. It is less numerous during dry periods, but increases enormously immediately after rain. The adults, which readily enter houses and attack man, are also commonly found among the stalks of hemp, which is largely cultivated in Modena and its vicinity. Sandfly fever is endemic and epidemic there.

CELLI (A.). **The History of Malaria in the Roman Campagna from Ancient Times . . . edited and enlarged by A. Celli-Fraentzel with a preface by Sir A. Castellani.**—Demy 8vo, viii + 226 pp., 1 map, 39 pp. refs. London, John Bale, Sons & Danielsson, Ltd, 1933. Price 10*s.* 6*d.*

The history of malaria in the Roman Campagna in Italy is traced from pre-Roman times through the periods of the Roman Republic, the Roman Empire, the early Middle Ages, the later Middle Ages, and the Modern Period up to the time of the discoveries of Laveran and Ross at the end of the 19th century. Each chapter is devoted to one of these periods and is subdivided wherever possible into sections giving notes on hydraulics, building, agriculture, sanitation, and popular and technical literature. In an appendix, A. Celli-Fraentzel deals briefly with the legislation enacted during the twentieth century and the present flourishing condition of this area.

PECORI (G.) & ESCALAR (G.). **La lutte contre le paludisme dans la Campagne Romaine en 1932.**—*Bull. Off. int. Hyg. publ.* **25** no. 10 pp. 1743–1746. Paris, October 1933.

A brief account is given of the anti-malarial work carried out in the Roman Campagna during 1932 [*cf. R.A.E.*, B **21** 43]. *Anopheles maculipennis*, Mg., was less abundant than in 1931, the number captured at the principal observation station being 10,918 as compared with 13,383 ; 14 per cent. were taken in human habitations. Only 0·5 per cent. of them were infected. The majority were var. *labranchiae*, Flni., although var. *messeae*, Flni., and var. *basilei*, Flni. (the typical *A. maculipennis* according to Martini [*cf.* **21** 136, 212]) were also found. At Ardea, 20 piggeries were placed round the village, with the result that the malaria index fell from 32·6 per cent. in 1931 to 8·94 in 1932, and the spleen index from 63·9 per cent. to 29·7. The malaria index for the whole area was reduced from 3·2 per cent. in 1931 to 2·6 in 1932.

BOYÉ (—). **L'utilisation de l'avion à Madagascar dans la prophylaxie anti-paludique pour l'épandage du " vert de Paris."**—*Bull. Off. int. Hyg. publ.* **25** no. 10 pp. 1766–1768. Paris, October 1933.

An account is given of the successful use in 1932 of an aeroplane for dusting extensive areas of marshes and rice-fields in Madagascar to destroy Anopheline larvae. A wooden receptacle, lined with zinc, holding about 300 lb. of dust containing 1 per cent. Paris green was fixed beneath the fuselage. The dust falls through a tube in the bottom, the outflow being regulated by a valve operated by means of a steel wire and a hand lever from a seat next to the pilot. The outlet of the tube occurs at the junction of two truncated cones joined by their narrow ends and so placed that the current of air from the propeller passing through the front cone projects the dust through the rear one. As road dust is not available in sufficient quantities, tests with various other carriers were made, and sifted wood ashes, slaked lime, or waste flour gave the most satisfactory results. The aeroplane should fly at a height of about 16–33 ft. and during windless weather.

On the day following treatment, a large number of dead mosquito larvae were found in the rice-fields. Four more applications at intervals

of 10 days gave similar results. At the same time, adult Anophelines became less numerous, and finally the number of malaria cases in the hospital was reduced almost to zero.

RAGAZZI (G.). **La malaria à Tauorga.**—*Arch. ital. Sci. med. colon.* **14** no. 4 pp. 264–276, 8 figs. Tripoli, 1st April 1933. (Abstr. in *Trop. Dis. Bull.* **30** no. 7 p. 466. London, July 1933; also in *Bull. Off. int. Hyg. publ.* **25** no. 10 p. 1807. Paris, October 1933.)

Owing to the numerous canals and marshes in the Oasis of Tauorga, Tripolitania, malaria (due to *Plasmodium falciparum*) is common. Of 500 mosquitos caught in the market place, 12 per cent. were *Anopheles coustani*, Lav. (*mauritianus*, Grp.), which is probably the vector.

Mosquito and Insect-borne Diseases.—*Med. Rep. Hlth sanit. Condit. N. Rhod. 1932* pp. 11–13. Livingstone, 1933.

The Anophelines collected as adults or bred from larvae by E. S. Adderley at Ndola, Northern Rhodesia, were *A. gambiae*, Giles, *A. funestus*, Giles, *A. coustani*, Lav. (*mauritianus*, Grp.), *A. maculipalpis*, Giles, *A. marshalli*, Theo., *A. squamosus*, Theo., *A. squamosus* var. *cydippis*, De Meillon, *A. rufipes*, Gough, *A. pretoriensis*, Theo., *A. theileri*, Edw., *A. argenteolobatus*, Gough, *A. distinctus*, Newst. & Cart., and *A. walravensi*, Edw. The first two were the only species commonly found in or near human habitations.

MOUNTJOY (J. E.). **An Observation on Mosquito Breeding in Pawpaw Trees.**—*E. Afr. med. J.* **10** no. 7 pp. 214–216, 4 figs. Nairobi, October 1933.

Larvae of *Aëdes* and *Culex* were found at Kigoma, Tanganyika Territory, in water in the hollow stems of papaya trees, to which both water and mosquitos usually gain access by means of holes or splits at the nodes.

DAUBNEY (R.). **Report of the Chief Veterinary Research Officer.**—*Rep. Dep. Agric. Kenya 1932* pp. 271–291. Nairobi, 1933.

Work by E. A. Lewis on the distribution of ticks in Kenya Colony [*cf. R.A.E.*, B **20** 21, 181] was confined in 1932 to a survey of the tick fauna of the Masai Reserve, where, in the absence of dipping, it could be studied under natural conditions. *Amblyomma variegatum*, F., *A. gemma*, Dön., and *Rhipicephalus evertsi*, Neum., are common and widely distributed, the first-named being predominant. *R. simus*, Koch, and *R. kochi*, Dön., are frequently taken on domestic stock. *R. pulchellus*, Gerst., is present on most animals, and inflammatory lesions caused by the bites of the larvae and nymphs have been observed on man. It may be found in any stage of development practically throughout the year in some districts. *Boophilus annulatus decoloratus*, Koch, is distributed throughout the Reserve, but infestations of cattle appear to be heavier in areas that are hilly and covered with thick bush. *R. appendiculatus*, Neum., seems to be absent over large areas, whereas others are heavily infested.

Glossina pallidipes, Aust., and *G. fusca*, Wlk., appear to be spreading in Kenya. Considerable areas of rich pasture have had to be abandoned and new grazing found beyond the range of the flies.

POULTON (W. F.). **Annual Report of the Veterinary Department, Uganda, 1932.**—Fol. 44 pp., 1 map. Entebbe, 1933.

Reclamation work against *Glossina morsitans*, Westw., begun in 1931 [*R.A.E.*, B **20** 219] was successfully continued during 1932. Detailed observations throughout south Ankole were impracticable, but records showed that in one area where, before clearing, 300–400 flies were caught in a morning, only 37 males and 9 females were taken during the period June–December, and in another, where the daily catch had varied from 70 to 400 flies, the total for the last six months of the year was 57 males and 18 females. It can be definitely stated that the dense masses of *G. morsitans* that existed in these and other centres have not migrated and re-settled in any uncleared area in south Ankole and it is concluded that they have died out. The one annual grass-burning substituted for the two previously carried out was well observed and gave excellent results, except where locusts had so reduced the bulk of the grass as to make clean burning impossible. *Acacia* in the burnt areas appears to be weakening, and it is thought that in 1933 the fires will further weaken and finally destroy a large number of these trees.

In an appendix, R. W. M. Mettam, Veterinary Pathologist, gives a list of five additional ticks found in Uganda with their hosts [*cf. loc. cit.*]. In experiments, no difficulty was experienced in rearing *Rhipicephalus appendiculatus*, Neum., *R. evertsi*, Neum., and *Boophilus annulatus decoloratus*, Koch, through their entire life-cycles, and *Amblyomma variegatum*, F., was reared on one occasion, except for the final stage.

PARROT (L.). **Phlébotomes du Congo Belge. IV. Sur *Phlebotomus africanus* var. *congolensis* Bequaert et Walravens, 1930.**—*Rev. Zool. Bot. afr.* **23** fasc. 3–4 pp. 239–240, 2 refs. Brussels, 15th October 1933.

From an examination of further specimens of *Phlebotomus africanus* var. *congolensis*, Bequaert & Walravens, from the Belgian Congo [*R.A.E.*, B **18** 201], the author concludes that this variety should be raised to specific rank and that *P. nairobiensis*, Thdr. [**20** 41] is a synonym of it. A further description of both sexes is given.

SCHWETZ (J.). **Notes parasitologiques sur la Plaine du Lac Edouard (Parc National Albert, Congo Belge).**—*Rev. Zool. Bot. afr.* **23** fasc. 3–4 pp. 259–266, 1 map, 6 refs. Brussels, 15th October 1933.

In the course of a brief survey of the plain to the south of Lake Edward carried out in June 1933, the author collected *Glossina palpalis*, R.-D., *G. fusca*, Wlk., *G. pallidipes*, Aust., and *G. fuscipleuris*, Aust., which was rare, *Ornithodorus moubata*, Murr., which was rare in native huts but abundant in the burrows of wart-hogs, where larvae, pupae and adults of *Auchmeromyia luteola*, F., were also found, *Anopheles gambiae*, Giles (*costalis*, Theo.), *Culex duttoni*, Theo., and a few individuals of *Mansonia* (*Mansonioides*) *africana*, Theo.

Li (Feng-swen) & Wu (Shih-cheng). **A preliminary Survey of Malaria and Anophelines in Hangchow.** [*In Chinese.*]—*Yearb. Bur. Ent. Hangchow* no. 2. (1932) pp. 323–331. Hangchow, 1933. (With an Abstract in English.)

Of 2,450 mosquitos taken in houses in Hangchow from July to October 1932, over 25 per cent. were *Anopheles hyrcanus* var. *sinensis*, Wied., which was probably the principal vector of malaria. The only other Anopheline taken in the town was *A. aitkeni*, James, although *A. lindesayi*, Giles, and *A. minimus*, Theo., have been observed in the neighbouring districts. Larvae of *A. hyrcanus* var. *sinensis* were found in 99·6 per cent. of the rice seed-beds, 61·9 per cent. of the rice-fields and 48·2 per cent. of the lily-ponds. Of the malaria cases, 37 per cent. were infected with *Plasmodium vivax* and 63 per cent. with *P. falciparum*.

Soesilo (R.). *Anopheles stigmaticus* **Skuse.**—*Geneesk. Tijdschr. Ned.-Ind.* **73** no. 22 pp. 1400–1403, 4 figs. Batavia, 24th October 1933. (With a Summary in English.)

Anopheline larvae received in May 1933 from northern Dutch New Guinea, where they were found in very cold, clear water in a channel with much overhanging grass at an altitude of about 6,000 ft., are regarded as belonging to the Australian species, *Anopheles stigmaticus* Skuse, despite some differences, noted here, from the description of the latter by MacKerras [*R.A.E.*, B **16** 29].

Malloch (J. R.). **Muscidae of the Marquesas Islands.**—*Bull. Bishop Mus.* no. 98 pp. 193–203, 1 fig. Honolulu, 1932. [Recd. December 1933.]

Among the species recorded is *Musca domestica*, L., of which the author considers *M. vicina*, Macq., to be at most a variety (differing only in the narrower frons of the male) that is apparently confined to the tropical regions of the Old World. It is remarkable that the farther from the tropics the examples are found, the wider is the frons.

Arakawa (Y.). **Studies on** *Phthirius pubis*. [*In Japanese.*]—*Insect World* **37** nos. 6–8 pp. 183–189, 220–228, 256–264. Gifu, Japan, June–August 1933. (With a Summary in English.)

An account is given of the bionomics of *Phthirus* (*Phthirius*) *pubis*, L., on man in Manchuria, where it is fairly abundant. All stages are described. The adults live about 3 weeks. The females lay an average of 41·7 eggs, which hatch in 5–9 days [*cf. R.A.E.*, B **7** 70], and the young lice reach maturity in 13–16 days. The immature stages feed for periods of 11–14 minutes and the adults for 20. Without food [*cf.* **1** 188], all stages died in 12–18 hours at 30–36°C. [86–96·8°F.] and in 22·61 hours at 10°C. [50°F.], and newly hatched lice in 7·44 hours at 36°C.

Ono (S.). **Morphological Studies on the Larvae of** *Hypoderma lineatum* **at the Oesophageal and Hypodermal Stages, with special reference to the Organ containing "Hypodermatotoxin."** [*In Japanese.*]—*J. Jap. Soc. vet. Sci.* **11** no. 3 pp. 208–223, 2 pls., 1 fig. Tokyo, September 1933. (With a Summary in English.)

The larval morphology and anatomy of *Hypoderma lineatum*, Vill., a serious pest of cattle in Manchuria, are described in detail. On

leaving the gullet, the larvae complete their development under the skin of the back [*cf. R.A.E.*, B **14** 163 ; **20** 86]. Five stages of the larvae under the skin are distinguished, the first four differing morphologically, but the last only in colour. In the first two stages, as in the gullet, they still contain the toxin that digests the host tissues, but not in the third, when they feed on pus in the holes [*cf.* **21** 251]. This toxin is a green, viscous fluid, apparently an enzyme, found in the mid-gut, which is dilated so as to occupy nearly three-fourths of the body-cavity. It inhibits coagulation of the blood and has proteolytic and histolytic properties.

ZAUBZER (T.). **Die Auswirkung einer sachgemäss durchgeführten Dasselfliegenbekämpfung.** [The Result of a properly conducted Campaign against Warble-flies.]—*Münch. tierärztl. Wschr.* **83** no. 51 pp. 605–606, 1 fig., 5 refs. Munich, 21st December 1932.

As the result of a co-operative campaign for the removal of larvae of warble-flies [*Hypoderma*] from cattle in the severely infested district of Garmisch, Bavaria, in 1929–32, the infestation was decreased by 87·3 per cent., the number of larvae collected falling from 29,790 in 1929 to 3,808 in the spring of 1932. The larvae were removed with a fairly thick (no. 5) crochet hook and forceps [*cf. R.A.E.*, B **20** 177] in spring and again in summer. It is believed that, if these measures were adopted by all the cattle-owners without exception, an isolated area could be freed from warble-flies in two years.

KOEGEL (A.). **Zur Frage der Immunisierung gegen Dasselkrankheit.** [On the Question of Immunisation against Warble Infestation.]—*Münch. tierärztl. Wschr.* **84** no. 6 pp. 62–65, 21 refs. Munich, 8th February 1933.

The author found specific precipitins in a calf that had been suckled by a cow infested by *Hypoderma*, its own mother having never been put out to pasture. In view of this evidence of the possibility of immunity being acquired by way of the digestive tract, he suggests that attempts should be made to immunise calves by adding to their food an extract of the larvae or a powder made of their dried bodies.

BEQUAERT (J. C.). **Contribution to the Entomology of Yucatan.**—*Publ. Carneg. Instn Wash.* no. 431 pp. 547–574, 4 figs., 2 maps, many refs. Washington, D.C., 1933.

In this paper, which is based chiefly on material collected during the Yucatan Medical Expedition of 1929 and 1930, notes are given on numerous poisonous, blood-sucking or parasitic Arthropods. The largest sections deal with the mosquitos, the Tabanids and the Hippoboscids, accounts of the last two of which have already been noticed [**20** 40, 104].

GRIBBEN (G. R.). **Mass Treatment with Plasmoquine.**—*Brit. med. J.* no. 3802 pp. 919–920. London, 18th November 1933.

In the course of this paper, which deals with the treatment of malaria in an area of southern Trinidad where the chief vector is *Anopheles tarsimaculatus*, Goeldi [*cf. R.A.E.*, B **20** 267], it is stated that mosquitos were unable to breed in the rain-water that gathered

in wrinkles on the Pitch Lake, owing to the presence of large numbers of the larvivorous fish, *Rivulus harti*. The lake was kept clear of grass, so that the free movement of these fish, which can easily make their way over the dry surface, might not be impeded. Small detached pools round the lake were regularly oiled.

SHANNON (R. C.). **Anophelines of the Amazon Valley.**—*Proc. ent. Soc. Wash.* **35** no. 7 pp. 117–143, 1 pl., 2 figs., 3 pp. refs. Washington, D.C., October 1933.

A detailed account is given of an Anopheline survey of the Amazon Valley carried out in 1931 between the end of March and the end of June, a period corresponding roughly to the latter part of the rainy season and presumably favourable for mosquito breeding. The species found were *Anopheles nimbus*, Theo., *A. thomasi*, Shannon, *A. kompi*, Edw., *A. mattogrossensis*, Lutz & Neiva, *A. peryassui*, D. & K., *A. mediopunctatus*, Theo., *A. fluminensis*, Root, *A. intermedius*, Chagas, *A. shannoni*, Davis, *A. darlingi*, Root, *A. albitarsis*, Arrib., *A. tarsimaculatus*, Goeldi, *A. strodei*, Root, and *A. bachmanni*, Petrocchi.

The Anophelines of Brazil as a whole may be divided into four groups, according to the general type of the region they inhabit, *viz.*: upland species; lowland marsh, swamp and jungle species; open country species (either upland or lowland); and species that breed in Bromeliads in forested country. The species of the Amazon Basin belong entirely to the second and third groups. *A. strodei* and *A. albitarsis* were found only at the periphery of the Basin, although a variety of the latter, *braziliensis*, Chagas, was found at Manáos. *A. darlingi*, which was found throughout the region from Bélem, near the mouth of the River, to Peru, and also on the northern border of Bolivia, appears to be the most important vector of malaria [*cf. R.A.E.*, B **20** 95]. It seems to breed primarily in flood-water, and this may explain its absence from towns sufficiently high to escape flooding (*e.g.* Iquitos, Peru), and consequently the low incidence of malaria in some of them. The malaria problem along the periphery of the Basin may be complicated by the presence of *A. albitarsis*. Lists are given of the Anophelines captured at each point surveyed, with a key to the females of the species found in the region.

The characters distinguishing the larvae of *A. thomasi*, *A. kompi* and *A. nimbus* are given. The identity of *A. mattogrossensis*, Lutz & Neiva (*amazonicus*, Christ.) is discussed; it is considered to be distinct from *A. vestitipennis*, D. & K. Descriptions are given of the larva of *A. mattogrossensis* and of the adult male and the pupa of *A. shannoni*, of which only the female had previously been described.

BISHOPP (F. C.). **Medical Entomology—its Field and Function.**—*Proc. ent. Soc. Wash.* **35** no. 7 pp. 144–158, 7 refs. Washington, D.C., October 1933.

After briefly reviewing the possible effects that insect-borne diseases have had on the course of history, the author discusses the Arthropods that affect man and animals by their direct attacks and those that transmit disease. He gives estimates, taken largely from the literature, of the losses due to some of the more prominent diseases and pests of vertebrates and briefly alludes to the beneficial results obtained from the use of malaria induced by mosquitos and of blow-fly larvae in the treatment of paresis and osteomyelitis respectively. The

function of medical entomology is to control injurious insects in order to prolong life, reduce economic losses and alleviate suffering, and the author next considers to what extent these ends have been and are being achieved. He points out that there are still innumerable problems to be solved, and briefly surveys the various sciences with which medical entomology is necessarily connected, indicating some of the questions in each that should be investigated and the need for co-operation of workers. He concludes that in the United States neither the time nor the money appropriated for this work is commensurate with the economic losses involved, and that the facilities for training students in medical entomology should be increased.

RICHARDSON (H. H.). **Insecticidal Studies of Midcontinent Distillates as Bases for Pyrethrum Extracts.**—*Industr. Engng Chem.* **24** no. 12 pp. 1394–1397, 17 refs. Easton, Pa, December 1932.

Kerosene extracts of pyrethrum were first used commercially in the United States as household sprays about 1912, and their use has rapidly increased since that time, the combination of a powerful paralytic insect poison, pyrethrum, with an efficient and somewhat toxic carrier, kerosene, producing an exceptionally potent insecticide. Examination of several popular household brands indicated that there was considerable variation in the properties of the petroleum fractions used as bases, the gravity ranging from 39·5 to 48·7° A.P.I., the initial boiling points from 310 to 380°F. (154·4 to 193·3°C.) and the end boiling points from 440 to 534°F. (226·7 to 278·9°C.). Investigations were therefore undertaken to determine what fractions are most efficient in the preparation of these extracts, and as low-boiling distillates cannot be used for household purposes because of the danger of explosion, and those boiling above 525°F. (274°C.) tend to leave non-volatile residues, the tests were confined to fractions boiling between 310 and 524°F. (154·4 and 273·3°C.). A short summary of the results has already been noticed [*R.A.E.*, B **19** 199].

The belief that pyrethrum was wholly responsible for the paralytic action and for the final mortality produced by the sprays is disproved by the experiments described. In each test, 40–50 house-flies (*Musca domestica*, L.) of the same age placed in an enclosed cage maintained at a constant temperature of 83 ± 1·8°F. (28·3 ± 1°C.), in which the air was kept well circulated with a fan, were sprayed with a constant volume (2·5 cc.) of the distillate. The number of paralysed flies was counted at intervals of 30 seconds until the majority had fallen. After 8 minutes, all the flies were counted and transferred to a small wire cage. As the resistance of the flies varied, each series of tests was carried out on the same day under the same conditions. The distillates with the heavier gravities (or higher boiling points) were most rapid in their paralysing action and most toxic; one with a gravity of 41·2° A.P.I. took 203 seconds to paralyse 50 per cent. of the flies and gave an ultimate mortality, after 24 hours in the cage at room temperature, of 35 per cent., whereas one of 49° A.P.I. gave a mortality of only 4 per cent. and at the end of 8 mins. only 38 per cent. of the flies were paralysed [*cf. loc. cit.*]. When pyrethrum extracts made with these two distillates and containing identical quantities of the powder were tested in the same way, the periods required to paralyse 50 per cent. were respectively 170 and 297 seconds, and the

ultimate mortalities 54 and 36 per cent. The latter of each pair of figures shows a lower toxicity than do those obtained in a further (comparable) experiment with the higher-boiling distillate alone (284 seconds and 42 per cent.). It thus appears that, in preparing pyrethrum extracts, the kerosene base used is at least as important as the amount of pyrethrum powder.

Napier (L. E.), Smith (R. O. A.) & Krishnan (K. V.). **The Transmission of Kala-azar to Hamsters by the Bite of the Sandfly** *Phlebotomus argentipes*.—*Indian J. med. Res.* **21** no. 2 pp. 299–304, 6 refs. Calcutta, October 1933.

An account is given of a further series of experiments in India on the transmission of kala-azar (*Leishmania donovani*) to Chinese hamsters (*Cricetulus griseus*) by means of the bites of *Phlebotomus argentipes*, Ann. & Brun. [*cf. R.A.E.*, B **15** 116 ; **17** 29 ; **19** 175], in which 2 out of 28 animals became definitely infected and one apparently had a transitory infection. If these results are compared with those of the previous experiments, it would appear that the essential factors for successful transmission are that the hamster shall survive for at least 400 days and that the feedings shall be given during a period when the atmospheric humidity is high. As, however, these conditions were fulfilled in 11 other cases in this series of experiments in which no transmission took place, it is obvious that other factors are also involved.

Sinton (J. A.). **Notes on some Indian Species of the Genus** *Phlebotomus*. **Part XXXVI. Diagnostic Table for the Males of the Species recorded from India.**—*Indian J. med. Res.* **21** no. 2 pp. 417–428, 4 pls., 67 refs. Calcutta, October 1933.

A key is given to the males of the species of *Phlebotomus* recorded from India [*cf. R.A.E.*, B **21** 226], a short explanation of many of the terms used in the key and a list of the more important papers on the morphology of these species being appended. In a footnote, the author states (on the basis of differences in Indian specimens) that *P. antennatus*, Newst., should no longer be regarded as a variety of *P. minutus*, Rond. [*cf.* **9** 119], but should be raised to specific rank ; if the Indian and African forms are distinct, he proposes the name *P. punjabensis* for the former.

Majid (S. A.) & Sinton (J. A.). **The Longevity of Females of** *Culex fatigans* **under Experimental Conditions, and the Duration of Malarial Infections in these Insects.**—*Indian J. med. Res.* **21** no. 2 pp. 455–466, 12 refs. Calcutta, October 1933.

An account is given of experiments carried out in the Punjab during 1932–33 on the longevity and infectivity of *Culex fatigans*, Wied., fed once on a sparrow infected with *Plasmodium* sp. and afterwards maintained on raisins and water.

The following is taken from the conclusions reached by the author after comparing his results with those of other workers using various species of mosquitos (including experiments with Anophelines and parasites of human malaria). It is probable that most adults of *C. fatigans* live for at least a month in nature. When, after an infecting feed, the mosquitos are kept under temperature conditions favourable

to a comparatively rapid maturation of all oöcysts and an invasion of the salivary glands by sporozoites, they may transmit the parasite for as long as 8 weeks, after which the sporozoites, although still actively motile, apparently tend to lose their infecting power. In *C. fatigans*, actively motile but apparently non-infective sporozoites were found 166 days after a single infecting feed, and non-motile sporozoites as late as 210 days. If the mosquitos are kept for the greater part of their lives at temperatures sufficiently low to inhibit or retard the growth of the parasite, the salivary glands may be continually replenished with fresh sporozoites from oöcysts maturing during periods of suitable temperature, and infections may thus be transmitted as late as 102 days after the primary infecting feed. The duration of infectivity in a mosquito fed periodically on infective blood would appear to be limited only by its span of life. If the glands are not replenished, biting seems to deplete the stock of sporozoites.

Maclean (G.). **Memorandum on Sleeping Sickness Measures.**—8vo, 6 pp. **Sleeping Sickness Notes.**—8vo, 7 pp. Dar-es-Salaam, Tanganyika med. Dep., 1933.

A brief summary is given of information on the subject of sleeping-sickness caused by *Trypanosoma rhodesiense*, with notes on the species of *Glossina* transmitting it in Tanganyika Territory and the measures undertaken for their control. The second paper deals particularly with the diagnosis and treatment of the disease.

Nash (T. A. M.). **A Statistical Analysis of the Climatic Factors influencing the Density of Tsetse Flies, *Glossina morsitans* Westw.**—*J. Anim. Ecol.* **2** no. 2 pp. 197–203, 2 pls., 4 refs. London, November 1933.

From a statistical analysis of the data collected during investigations on *Glossina morsitans*, Westw., in Tanganyika Territory from 1928 to 1932 [*cf. R.A.E.*, B **21** 197], in which the coefficients of correlation were calculated for the mean monthly fly density with the mean monthly figures for temperature, rainfall, evaporation and saturation deficiency for the same month, the previous month and the month before that, it is concluded that the numbers of the fly are influenced by the incidence of rainfall, but to a greater extent by that combination of temperature, humidity and wind that is expressed either as evaporation [*cf.* **19** 253] or saturation deficiency. Temperature by itself does not affect fly density.

Jackson (C. H. N.). **On the true Density of Tsetse Flies.**—*J. Anim. Ecol.* **2** no. 2 pp. 204–209, 4 refs. London, November 1933.

Descriptions are given of two methods for estimating the actual density of tsetse-flies, in terms of the number of flies per unit area, one of which is suitable for use in areas not isolated from the remainder of the fly-belt, and the other for isolated areas of moderate extent. The former is attended by great practical difficulties, but the latter was used in two experiments with *Glossina morsitans*, Westw., in central Tanganyika Territory in 1932, which are here described. Both methods depend in principle on releasing a known number of marked flies, computing the number still living on some date subsequent to their release and finding the proportion in random samples taken on

that date of marked to unmarked individuals. As the total number of marked flies released is known, the total number of unmarked flies may be calculated from this ratio. In the experiments, the numbers of females marked and recaptured were too small to use, so that the male density was estimated and doubled, since it seems probable that in nature the sexes exist in approximately equal numbers. The figures obtained were reduced to show the number of flies of both sexes that would represent the actual density per square mile if the apparent density were one male fly per linear mile collected by routine methods at the time of year when apparent fly density is at its maximum. The results of one experiment by the second method gave 1,200–1,600 flies per square mile.

Jackson (C. H. N.). **On a Method of Marking Tsetse Flies.**—*J. Anim. Ecol.* **2** no. 2 pp. 289–290. London, November 1933.

A description is given of a method of marking flies in the field, evolved in connection with investigations on *Glossina morsitans*, Westw., in Tanganyika Territory [*R.A.E.*, B **19** 61]. The back of the thorax is marked by means of a grass stem with 2–5 spots of oil paint applied in a combination of two colours to indicate the date and in different relative positions to show such particulars as the locality in which the fly was collected and its state of hunger. Dark and light blue, dark and light green, brown, vermilion, pink, orange, ochre, yellow, white, purple and grey are the colours most easily distinguished in the field and provide combinations for 78 days. On recapture, further marks in the two colours selected for the day are placed round the periphery of the thorax in different relative positions, which are recorded by comparing them with the position of the hands on the face of a clock. As no two flies originally marked alike are given the same second marking on any day, and the colours are always changed daily, a fly once re-marked has no duplicate throughout the experiment and will need no further mark if captured and released again.

Holdaway (F. G.). **Differential Behaviour of *Lucilia sericata* Meig. and *Lucilia caesar* L. in Natural Environments.**—*J. Anim. Ecol.* **2** no. 2 pp. 263–265, 1 ref. London, November 1933.

Experiments carried out in the course of studies on *Lucilia sericata*, Mg., at Toulouse [*R.A.E.*, B **18** 273] with traps baited with meat, showed that it frequents open habitats, whereas *L. caesar*, L., and *L. ampullacea*, Villen., which was considerably less abundant, are commoner in shady ones. The proportions of the species in the same traps varied according to whether the day was sunny or dull. The range of waves of radiant energy that favour activity is probably higher for *L. sericata* than for the other two. In fairly cool, cloudy weather, the latter probably frequent open environments, but with the advance of summer even a relatively high degree of cloud probably does not lower the radiant energy sufficiently to render these environments favourable.

Schilling (C.) & others. **Immunisierung gegen Trypanosomen-Krankheiten.** [Immunisation against Trypanosome Diseases.]—*Bull. Soc. Path. exot.* **26** no. 8, pp. 1004–1008. Paris, 1933. (With a Summary in French.)

In view of the possibility that the immunity of game animals from trypanosomiasis in Africa is due to their infection when young by

Glossina, the senior author began experiments in 1912–14 with *Trypanosoma brucei* and calves. In 1930, the work was resumed in Berlin with *T. congolense*, two foals being used. One received an injection, when 8 days old, of a dry antigen of *T. congolense* and was then bitten by tsetse-flies (*Glossina morsitans*, Westw.) infected with this trypanosome. A resultant chronic infection did not prevent normal growth ; each new series of bites was followed by a temporary attack of trypanosomiasis. The second foal was infected by bites and, after treatment with a remedial half-dose of antimosan, was exposed to further bites. Its reactions were similar to those of the first animal. An old horse used as a control died in 66 days.

Roubaud (E.). **Flagellose des euphorbes, en région maritime dans l'ouest de la France.**—*Bull. Soc. Path. exot.* **26** no. 8 pp. 1109–1010, 3 refs. Paris, 1933.

The author records the presence of *Herpetomonas* (*Leptomonas*) *davidi* in the latex of *Euphorbia cyparissias* growing in pine woods on the sea coast of Vendée, France. Several individuals of the Coreid, *Stenocephalus agilis*, Scop., were found on the infected plants but none on the uninfected ones. Attempts to transmit *H. davidi* to *E. helioscopia* by means of *S. agilis* gave negative results [*cf. R.A.E.*, B **14** 190 ; **16** 38, etc.].

Descazeaux (—) & Morel (—). **Diagnostic biologique (xénodiagnostic) des habronémoses gastriques du cheval.**—*Bull. Soc. Path. exot.* **26** no. 8 pp. 1010–1014, 1 ref. Paris, 1933.

Horses are parasitised by the Spirurids, *Habronema megastoma*, *H. muscae* and *H. microstoma*, the larvae of which cause cutaneous and pulmonary lesions. Control by treatment of the adults is difficult, because they cause little injury and provoke no symptoms. The authors describe a method of diagnosing infestation in which eggs of the vector (*Musca domestica*, L. in the case of the first two and *Stomoxys* [*calcitrans*, L.] in the case of the third) are placed on the excreta of a suspected animal and larvae of the Nematodes sought in the proboscis of the resulting flies. The flies complete their life-cycle in 8–12 days, whereas the larvae of *Habronema* reach maturity in 12–17 days ; it would thus appear advisable to dissect the flies 5–6 days after emergence, although parasite larvae of the first and second stage may be found by careful examination in fly larvae 3–5 days old. In this case, larvae of *H. megastoma* may be differentiated from those of *H. muscae* by the fact that the former are found on a level with the malpighian tubes and the latter in the cells of the fat-body. The presence of *H. muscae* was diagnosed by this method in all of 12 animals examined ; *H. megastoma* was less numerous, but was present in the six horses with summer sores. Three horses with ordinary sores showed slight infestation with *H. muscae* only, and of three with no lesions, one showed heavy infestation with both Spirurids and the other two slight infestation with *H. muscae*.

This method of diagnosis is only possible during the hottest part of the year, from mid-June to mid-September, a period corresponding very closely to the time of oviposition of the female *Habronema* in the

stomach of the horse, and of the appearance of summer sores. Treatment of parasitised horses should be carried out towards the middle of September when the still undeveloped larvae will be more easily reached by the medicament than the adults, which have frequently penetrated into the mucous membrane of the stomach. It is suggested that this method of xenodiagnosis might be used to detect numerous other helminthic affections of man and animals.

[Martzinovskiĭ (E.)] Marzinovsky (E.). **A propos de la moustiquaire.**—*Bull. Soc. Path. exot.* **26** no. 8 pp. 1018–1020. Paris, 1933.

The author describes a mosquito net in which the sides are of netting sufficiently fine to prevent the entrance of mosquitos or sandflies, but of which the top and bottom are of a more closely woven material and the edges of the latter turn up for about a foot where they are joined to the sides. The net should be red, orange, mauve or black, as these colours are less attractive to mosquitos. The advantages of this net are that the thick top prevents dust falling on the sleeper from above, the thick bottom makes it possible to sleep on the floor or the ground, the turned up edges are a protection against the bites of insects and prevent the entrance of scorpions, snakes, etc., and it is cheaper than one made entirely of netting.

Toumanoff (C.). **Recherches sur la fréquence saisonnière de diverses espèces anophéliennes au Tonkin (Bassin du Fleuve-Rouge). 3e note : *A.* (*Neocellia*) *maculatus* (Theo.).**—*Bull. Soc. Path. exot.* **26** no. 8 pp. 1020–1022, 1 chart. Paris, 1933.

A brief account is given of the seasonal prevalence of *Anopheles maculatus*, Theo., in the three regions where it is found in the valley of the Red River, Tonkin [*R.A.E.*, B **21** 190]. It occurs chiefly in the middle and high regions, where its presence nearly always coincides with zones where malaria is hyperendemic [*cf.* **21** 122]. It is fairly numerous in January, increases to its maximum in March, decreases in April, is rare from May to September and increases again during October-December. It is thus abundant during the dry season (winter monsoon). Its distribution and seasonal occurrence coincide with those of *A. minimus*, Theo. [*cf.* **21** 190, 220]. The abundance of these species during the winter monsoon must bring about a closer relation with man, a supposition that seems all the more probable in that infected individuals of *A. minimus* are most numerous at this time and that the two records of infection of *A. maculatus* also occurred then.

Kamaloff (N. G.). **Sur la faune des phlébotomes de la Géorgie.**—*Bull. Soc. Path. exot.* **26** no. 8 pp. 1071–1076, 13 refs. Paris, 1933.

Notes are given on the distribution in Georgia of *Phlebotomus papatasii*, Scop., *P. caucasicus*, Marz., *P. kandelakii*, Shchur., *P. chinensis*, Newst., *P. major*, Ann., and *P. sergenti*, Parr.

Robin (L.). **Recherches sur les variations saisonnières d'incidence de l'infection palustre en Indochine méridionale de 1926 à 1932.**—*Bull. Soc. Path. exot.* **26** no. 8 pp. 1076–1083. Paris, 1933.

From data on blood examinations of hospital patients during 1926–32, the author concludes that in the southern part of Indo-China there

are two malarious periods, July–September and December–March, the maximum incidences occurring in July and December. The highest rates of malaria infection among the population inhabiting the hyperendemic zone of the same region also occur during these two months. The increase in malaria during December–March coincides with an increase in the numbers of the principal local vector, *Anopheles minimus*, Theo., which has also been found infected most frequently during this period. The malaria rate has gradually decreased from 59·10 to 11·22 per cent. in the plantations of the hyperendemic region since 1928, when anti-malarial measures were put into force, whereas the rate for the rest of the region, where such measures have not been undertaken, has remained at about 17 per cent. for the three years 1929–32.

Mathis (C.), Durieux (C.) & Advier (M.). **Transmission naturelle et expérimentale à l'homme du spirochète infectant dans la nature, à Dakar, la tique** *Ornithodorus erraticus* **vel** *marocanus*. **(Note préliminaire.)**—*Bull. Soc. Path. exot.* **26** no. 8 pp. 1094–1098. Paris, 1933.

A brief account is given of ten experiments in which ticks (*Ornithodorus erraticus*, Lucas) taken at Dakar from places in which cases of human relapsing fever had occurred were allowed to feed on man. Infection resulted in seven cases, although in only one was the temperature curve that of typical relapsing fever. It is therefore concluded that at Dakar *O. erraticus* transmits to man the spirochaete that infects small mammals in nature [*cf. R.A.E.*, B **20** 139].

Papers noticed by Title only.

Barraud (P. J.). **A Method of making Slide Smears from Female** *Anopheles* **for Examination for Sporozoites of Malaria Parasites, and of preserving the Mosquitoes for Reference.**—*Indian J. med. Res.* **21** no. 2 pp. 451–454, 2 figs., 9 refs. Calcutta, October 1933.

Ewing (H. E.). **The Taxonomy of the Anopluran Genus** *Pediculus* **Linnaeus** [including a key to the subgenera and a list of the species and varieties].—*Proc. biol. Soc. Wash.* **46** no. 36 pp. 167–174, 2 figs., 4 refs. Washington, D.C., 26th October 1933.

Schulze (P.). **Neue Ixodiden aus den Gattungen** *Amblyomma* **und** *Aponomma*.—*Zool. Anz.* **104** no. 11–12 pp. 317–323, 7 figs., 6 refs. Leipzig, 15th November 1933.

Ewing (H. E.). **New Genera and Species of parasitic Mites of the Superfamily Parasitoidea.**—*Proc. U.S. Nat. Mus.* **82** Art. 30 no. 2971, 14 pp., 4 pls. Washington, D.C., 1933.

Bequaert (J.). **Notes on Hippoboscidae. 7. A tentative Key to the Species of** *Olfersia* **Wiedemann** (*Feronia* **Leach : *Pseudolfersia* Coquillett).**—*Psyche* **40** no. 3 pp. 101–105. Boston, Mass., September 1933.

Theodor (O.). **A Note on** *Phlebotomus vexator*, **Coquillet (Dipt.)** [details of both sexes].—*Stylops* **2** pt. 12 pp. 274–276, 2 figs., 3 refs. London, 15th December 1933.

McCulloch (R. N.). **Jetting Mixtures for the Control of Sheep Blowfly Attack. Experiments carried out during 1932–33.**—*Agric. Gaz. N.S.W.* **44** pt. 10 pp. 766–774. Sydney, October 1933.

An account is given of experiments carried out in New South Wales in 1932–33 on various jetting mixtures for the protection of sheep against blow-flies. The calcium arsenite mixture (10 lb. white arsenic, 10 lb. stone lime and 1 lb. sodium hydroxide in 100 gals. water) previously used [*R.A.E.*, B **20** 232] gave better protection than a solution of sodium arsenite (8 or 10 lb. white arsenic and 12 or 13 lb. sodium carbonate in 100 gals. water), a suspension of Paris green (10 lb. Paris green, 4 lb. soft soap and 100 gals. water) or a proprietary dip. It was slightly less satisfactory under conditions of light infestation than a suspension of specially fine Paris green, but is considered the best mixture for use in the field. A modified calcium arsenite mixture (8 lb. white arsenic, 5 lb. stone lime and 3 lb. sodium hydroxide in 100 gals. water) did not prove superior and was more difficult to prepare.

The value of jetting with arsenicals appears to depend as much on the limiting of the spread of attacks as on their prevention. The first calcium arsenite mixture protected the sheep from serious infestation for about 4–6 weeks in two localities. The maximum time before hand-dressing or re-jetting is necessary has not been determined, but it is known to be longer than when sodium arsenite is used. The presence of sores resulting in large, hard scabs in the wool away from the skin was due to jetting at excessive pressure, more than 150 lb. per sq. in. apparently being injurious.

Pijper (A.) & Dau (H.). **Zuid-Afrikaansche tekebeetkoorts en behandeling van algemeene paralyse.** [South African Tick-bite Fever and the Treatment of General Paralysis.]—*Ned. Tijdschr. Geneesk.* **77** II no. 18 pp. 2030–2037, 5 figs. Haarlem, 6th May 1933. (With Summaries in German and English.)

Tick-bite fever, which is transmitted in South Africa by *Amblyomma hebraeum*, Koch (in the larval stage only) is a very mild typhus-like disease with a primary necrotic sore [*R.A.E.*, B **18** 181]. The virus has reached its 70th passage in guineapigs in the author's laboratory at Pretoria, and has been tried in the treatment of general paralysis of the insane. No improvement was noted, but some fever was produced and in one case the virus was recovered from the patient and re-inoculated into guineapigs without apparently having changed its nature.

Goré (R. N.). **A Feather-duster Mosquito-trap. (A Simple Device for catching Mosquitoes in Houses.)**—Demy 8vo, 10 pp., 3 charts. Bombay, the author, 1933. Price *Annas* 4.

A dark-coloured feather duster, held erect by inserting the shortened handle in an empty bottle, is left in an undisturbed place throughout the night. After 10 a.m. next morning, when the mosquitos that have settled on it are quiescent, a cylindrical bag with a ring at the bottom is lowered over the trap. The bag is then grasped round the handle of the duster, which is lifted out of the neck of the bottle, gently shaken, and drawn out through the grasp to leave the mosquitos in the bag. By sliding the hand up the bag the mosquitos are driven to the top so

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that it can be placed over another trap. Nearly 90,000 mosquitos were caught in six such traps in operation for a year in a house in Bombay.

[**Mosquito Control Work in 1932.**]—*Proc. 20th Mtg N. J. Mosquito Ext. Ass. 1933*, 117 pp. New Brunswick, N.J., 1933.

In addition to reports on local mosquito situations and control work in Connecticut, Delaware, New Jersey and New York, the following papers are included: Some Accomplishments in Mosquito Work throughout the World during 1932, by F. C. Bishopp (pp. 63–90), and Mosquito Suppression Work in Canada in 1932, by A. Gibson (pp. 92–102).

James (S. P.), Nicol (W. D.) & Shute (P. G.). *Plasmodium ovale* **Stephens 1922.**—*Parasitology* **25** no. 1 pp. 87–95, 1 pl., 15 refs. Cambridge, 1933.

Gibbins (E. G.). **Morphological Study of Malaria Pigment in Oocysts of naturally infected** *Anopheles*.—*T.c.* no. 4 pp. 428–435, 4 figs., 7 refs.

In the course of the first paper, notes are given on the character and arrangement of the pigment in the oöcysts of the four species of *Plasmodium* pathogenic to man (*ovale, vivax, falciparum* and *malariae*) in the stomach of the mosquito.

The following is the author's summary of the second paper: The different types of malaria pigment occurring in oöcysts of naturally infected *Anopheles* caught in human dwellings at Kampala, Uganda, are described and figured (selection from 204 camera lucida drawings). The exact significance of each particular type of pigment is uncertain, and in the present state of our knowledge it is not possible to do more than place them tentatively into four groups and to indicate to which species they probably belong.

Roughley (T. C.). **The Cult of the Goldfish.**—8vo, xiii+146 pp., 29 pl. (1 col.). Sydney, Angus & Robertson Ltd., 1933. Price 5*s*. 3*d*.

A chapter on the animal pests of goldfish in ponds in Australia contains brief notes on the insects that attack them. These include dragonfly larvae, Dytiscid, Gyrinid and Hydrophilid beetles, Trichoptera, and Belostomid, Nepid, Notonectid and Corixid bugs. The chief enemies of young goldfish are adults and larvae of Gyrinids.

Ingram (W. W.) & Musgrave (A.). **The Poisonous Spiders of Australia.** *Aust. Mus. Mag.* **5** no. 4 pp. 121–125, 1 col. pl., 1 ref. Sydney, 1933.

Cases of spider bites with fatal results have been recorded in Australia since 1863. There were 7 fatal cases from 1927 to December 1932. The three spiders definitely regarded as harmful to man in Australia are *Atrax robustus*, P.-Camb., *A. formidabilis*, Rainbow, and *Latrodectus hasselti*, Thorell.

Brumpt (E.). **Paralysie ascendante mortelle expérimentale du chien par piqûre de la tique australienne :** *Ixodes holocyclus*.—*C. R. Acad. Sci. Fr.* **197** no. 22 pp.1358–1361, 2 figs. Paris, 1933.

The author records various experiments with *Ixodes holocyclus*, Neum., which causes paralysis that is often fatal to man and domestic animals in Australia [*R.A.E.*, B **15** 32]. In one of them, 2 female ticks that were allowed to feed on a dog caused death in 8 days.

Sergent (Ed.), Sergent (Et.) & Castanei (A.). **" Maisons à paludisme " et " instinct de retour à la pâture " chez les moustiques.**—*C. R. Acad. Sci. Fr.* **197** no. 26 pp.1711–1713. Paris, 1933.

In experiments to test the theory that mosquitos tend to return for the second feed to the place where they obtained their first, a caged breeding-place of *Culex pipiens*, L., was connected by tubes to two cages, one containing a canary infected with *Plasmodium praecox* (*relictum*) and a healthy one, and the other two healthy ones. If the mosquitos that fed first on the infected canary returned after ovipositing to the same cage for the second feed, the healthy bird would become infected, and the birds in the other cage would remain healthy. As, in fact, the healthy canaries in both cages became infected, it would appear that *C. pipiens* has no instinct of return to the feeding place and, if the same is true of Anophelines, some other explanation of the occurrence of " malaria houses " must be sought [*cf. R.A.E.*, B **20** 191].

Parrot (L.), Donatien (A.) & Lestoquard (F.). **L'étiologie des leishmanioses.**—*Algérie méd.* **36** pp. 139–171, 2 pls., 3 figs., 139 refs. Algiers, 1932. [Recd. November 1933.]

From a critical review of the literature, including their own observations, the authors conclude that *Leishmania infantum* is probably identical with *L. donovani*, which is the causal organism of visceral leishmaniasis in man and dogs, but that *L. tropica* is probably distinct. Although the transmission of Oriental sore by *Phlebotomus* appears to have been proved, the mode of transmission of visceral leishmaniasis is not yet definitely known.

Senevet (G.) & Collignon (E.). **Apparition précoce d'*Anopheles hispaniola* en Algérie.**—*Arch. Inst. Pasteur Algérie* **11** no. 3 p.464. Algiers, 1933.

Two first-instar larvae of *Anopheles hispaniola*, Theo., were found in water containing filamentous green algae on 15th April 1933, and larvae were numerous in different localities of the Tell in May and June, although the earliest time at which this species breeds in Algeria is usually considered to be the end of July.

Shuzo Asami. **Propagation de la lèpre par les insectes.**—*La Lepro* no. 1 1932. (Abstr. in *Bull. Off. int. Hyg. publ.* **25** no. 11 p. 2006. Paris, November 1933.)

In wards occupied by lepers in an advanced stage of the disease, 118 out of 447 flies collected contained leprosy bacilli ; in rooms inhabited by families of lepers, 41 out of 1,786 ; in a leper settlement and its vicinity, 9 out of 192 ; and in the same locality in a house where there were no lepers, 1 out of 76. Of flies fed on infected material, 6 out of 10 examples of *Calliphora lata*, Coq., became infected, 44 out of 98 of *Lucilia cuprina*, Wied. (*argyricephala*, Macq.), 16 out of 53 of *Musca*

domestica, L., and 8 out of 78 of *Fannia canicularis*, L. The bacilli lived for more than 24 hours in 88 out of 224 flies, for more than 48 in 6 out of 40, for more than 72 in 5 out of 61 and for more than 96 in 2 out of 41. Of 1,784 examples of *Pulex irritans*, L., collected in the room of a leper, 20 were infected, and in another case 6 out of 354.

Liddo (S.). **Decistamento delle amebe nel tubo digerente delle mosche.** [The Bursting of Amoebic Cysts in the Digestive Tract of Flies.]—*Boll. Accad. pugliese Sci.* 1933, no. 2, p. 109. (Abstr. in *Boll. Inst. sieroter. milan.* **12** fasc. 10 p. 815. Milan, October 1933.)

Cysts of amoebae of the *Limax* type can burst in the digestive tract of *Musca domestica*, L. If this applies also to pathogenic amoebae, it may possibly increase the sources of infection by rendering available a different environment, since amoebae left exposed in the cyst state are liable to perish, particularly through desiccation.

Boettger (C. R.). **Ueber die Artzugehörigkeit des in Italien zur Malariabekämpfung eingeführten Zahnkärpflings.** [On the Identity of the Species of Top-minnow introduced into Italy for Malaria Control.]—*Zool. Anz.* **105** no. 1–2 pp. 9–14, 21 refs. Leipzig, 1st December 1933.

An investigation of the morphology of the species of *Gambusia* acclimatised in Italy for the control of mosquito larvae showed it to be not *G. holbrooki*, as has been generally believed, but *G. patruelis*.

[Dmitriev (I. D.) & Artem'ev (A. I.).] **Дмитриев (И. Д.) и Артемьев (А. И.). A few Data on the Survival of the Larvae of the Malaria Mosquito.** [*In Russian.*]—*Med. Parasit. parasit. Dis.* **1** no. 5–6 pp. 259–261, 4 graphs. Moscow, 1932. [Publ. 1933.]

In the course of investigations on *Anopheles maculipennis*, Mg., in Transcaucasia in 1925, larvae were collected from four natural water reservoirs every 10 days during the summer. Of the total number of larvae, 475 were in the first instar, 319 in the second, 191 in the third and only 121 in the fourth. In experiments on the survival of the larvae in 1931, 3,750 eggs obtained from females taken engorged in stables were distributed in five pits fed with water from an irrigation canal. The pits were covered with muslin, so that the emerging adults could be captured and counted. The temperature of the water ranged from 16 to 23°C. [60·8–73·4°F.], and the pH averaged 7·6. Emergence began on the 13th–16th day and continued for several days. The total numbers of first, second, third and fourth instar larvae and of adult mosquitos developing in the pits were estimated to represent 63·8, 42·7, 25·5, 15·9 and 15·6 per cent. respectively of the total number of eggs.

[Prendel' (A. R.), Zagorovskiĭ (N. A.) & Futran (G. S.).] **Прендель (А. Р.), Загоровский (Н. А.) и Футран (Г. С.). Data on the Acclimatisation of *Gambusia* in the U.S.S.R.** [*In Russian.*]—*Med. Parasit. parasit. Dis.* **1** no. 5–6 pp. 261–264, 10 refs. Moscow, 1932. [Publ. 1933.]

An account is given of observations in Odessa in 1930–32 to determine whether *Gambusia* can thrive under the climatic conditions of southern Ukraine. Notes on its biology are included [*R.A.E.*, B **19**

26]. It was found that the fish can survive the winter (in a pond in which the water was covered with ice for 3½ months), and multiply in large numbers during the summer and autumn without being given artificial food. They lived for several months in water the salinity of which was gradually increased from 0·5 to 1·5 per cent., but died in a few days in water containing 2 per cent. NaCl. They also lived in naturally brackish water in drainage ditches, in which the salt content did not exceed 0·6 per cent. This power of adaptation to brackish water is of special importance on the north-western coast of the Black Sea, where the stagnant water in which mosquitos breed in spring often becomes brackish in summer.

[Pavlova (P. I.).] **Павлова (П. И.). Artificial Alteration of the Active Reaction of Water Reservoirs for the Control of the Larvae of the Malaria Mosquito.** [*In Russian.*]—*Med. Parasit. parasit. Dis.* **1** no. 5–6 pp. 265–266. Moscow, 1932. [Publ. 1933].

In the summer of 1930, field experiments were carried out near Moscow on the control of Anopheline larvae [*Anopheles maculipennis*, Mg.] in pits in peat-bogs, etc., by modifying the hydrogen-ion concentration of the water [*cf. R.A.E.*, B **18** 10] and comparing the results with those obtained with oil and Paris green. The larvae were destroyed when the pH of the water in the pits was reduced to 1·9 by the addition of sulphuric acid, and this figure was approximately maintained for about two months in pits with a clay bed. In those having a sedge-peat bed, however, the action of the acid was neutralised in a comparatively short time by the alkaline reaction of the peat, after which the mosquito larvae again occurred.

Kritschewski (I. L.) & Rubinstein (P. L.). **Das Fleckfieber bei den wilden Ratten in Moskau. i. Mitteilung.** [Typhus in wild Rats in Moscow. First Communication.]—*Zbl. Bakt.* (I, Orig.) **129** no. 7–8 pp. 493–501, 10 figs., 12 refs. Jena, 6th October 1933.

After a brief review of the literature on the relation between the epidemic form of typhus transmitted by lice [*Pediculus humanus*, L.] and the endemic human and murine typhus of North America [*R.A.E.*, B **20** 244–246, etc.], the authors give the results of their investigations on the black rat [*Mus rattus*] in Moscow in 1932, from which they conclude that it is infected with the endemic and not the epidemic form. They believe that in Russia there are two different micro-organisms concerned, the one causing louse-borne typhus in man and the other murine typhus. As, however, rats and their ectoparasites are the only source of typhus infection of man in the United States, their possible epidemiological importance in the Russian Union should be thoroughly investigated, although it is probably a subordinate one, and measures for the control of typhus should be directed against rats as well as lice.

Frickhinger (H. W.). **Gase in der Schädlingsbekämpfung.** [Gases in the Control of Pests.]—*Flugschr. dtsch. Ges. angew. Ent.* no. 13, 88 pp., 38 figs., 16 pp. refs. Berlin, P. Parey, 1933. Price *M.*4·50.

This survey of the uses of gases in the control of pests is arranged according to the fumigants, nearly half of the text being devoted to hydrocyanic acid gas. Information is given on the nature of each of

the eleven fumigants dealt with, the methods of using it and the pests against which it is employed. The bibliography has a general section followed by sections for each fumigant.

KORKHAUS (R.). **Zur parasitologisch-pathologischen Bedeutung der Tyroglyphidae, Tyrophagidae und Glycyphagidae in tierischen Organismen.** [On the Parasitic and Pathological Importance of Tyroglyphid, Tyrophagid and Glycyphagid Mites in Animal Tissue.] —*S. B. Ges. naturf. Fr. Berl. 1933* no. 1–3, pp. 51–65, 7 pp. refs. Berlin, 1933.

It is concluded from a review of the literature that, though these mites are not true parasites in animal tissue, when ingested with food, they may produce both in man and animals pathological symptoms of the allergic type [*R.A.E.*, B **18** 22].

NIESCHULZ (O.). **Ueber die Temperaturbegrenzung der Aktivitätsstufen von** *Stomoxys calcitrans*. [On the Temperature Range of the various Degrees of Activity of *S. calcitrans*.]—*Z. Parasitenk.* **6** no. 2 pp. 220–242, 3 figs. Berlin, 23rd November 1933.

In these experiments with *Stomoxys calcitrans*, L. [*cf. R.A.E.*, B **21** 187, 281], test-tubes containing the flies were stood in a water-bath, and the temperature was raised 1°C. [1·8°F.] every 3 minutes. The results were not affected by atmospheric humidity, sex, age, amount of feeding, or egg maturation. On an average, the flies began to become active at 10·1°C. [50·18°F.]; heat paralysis began at an average of 42·6°C. [108·68°F.] and was complete at 43·6°C. [110·48°F.]. Normal activity lay between 18°C. [64·4°F.] and 28·2°C. [82·76°F.], and increased activity between 28·2°C. and 36·8°C. [98·24°F.]. Optimum temperature appeared to be about 28°C. [82·2°F.].

NIESCHULZ (O.) & DU TOIT (R.). **Ueber die Temperaturabhängigkeit der Aktivität und die Vorzugstemperatur von** *Stomoxys calcitrans*, *Musca vicina* **und** *M. crassirostris* **in Südafrika.** [On the Dependence on Temperature of Activity in *S. calcitrans*, *M. domestica vicina* and *Philaematomyia crassirostris* and their preferred Temperatures in South Africa.]—*Zbl. Bakt.* (2) **89** no. 8–12 pp. 244–249, 4 refs. Jena, 23rd November 1933.

In experiments in South Africa, the behaviour of adults of *Stomoxys calcitrans*, L., at different temperatures was practically the same as that of European examples [see preceding abstract]. With *Musca domestica vicina*, Macq., heat paralysis began at 45·4°C. [113·72°F.] and was complete at 46·5°C. [115·7°F.]. Reaction to other temperatures was similar to that of *S. calcitrans*, but the optimum temperature averaged 33·5°C. [92·3°F.]. The reaction of only 3 males and 5 females of *Philaematomyia* (*M.*) *crassirostris*, Stein, was noted; the first movement occurred at 10·4°C. [50·72°F.], and heat paralysis began at 44·9°C. [112·82°F.] and was complete at 46·3°C. [115·34°F.].

DU TOIT (R.) & NIESCHULZ (O.). *Musca crassirostris*, **a bloodsucking Fly new to South Africa.**—*J. S. Afr. vet. med. Ass.* **4** no. 2 pp. 97–98, 1 fig., 5 refs. Johannesburg, June 1933. [Recd. December 1933.]

Philaematomyia (*Musca*) *crassirostris*, Stein, which has not previously been recorded from South Africa, was found in fairly large numbers

during March and April 1933 in the Pretoria district, where it attacks horses, mainly on the veldt and in kraals; it apparently enters stables only occasionally.

DE VRIES (A. H.). **A cheap and effective Blowfly Trap.**—*Fmg S. Afr.* 1933 reprint no. 50, 3 pp., 7 figs. Pretoria, September 1933.

In view of the fact that few farmers in South Africa can afford to buy a sufficient number of large blow-fly traps to be effective, the author describes a cheap trap that he has evolved and tested. The lower of the two iron bands on an upright 44-gallon iron drum closed at both ends is removed and the drum cut in two at this point. Inside the upper part is fitted a cone of wire gauze, the lower edge of which is turned up outside the lower edge of the upper part of the drum. A hole 10 ins. in diameter is cut in the top of the drum and covered with wire gauze. Baling wire is laced through holes drilled 4 ins. from the bottom of the lower part of the drum to form a grid on which the bait is placed. The upper part of the drum is supported 2 ins. above the lower part by means of legs, and the opening thus formed is protected from the light (but not closed) by means of an overhanging skirt of sheet iron or tin 7 ins. wide fastened to the lower edge of the upper part of the drum. The flies enter the trap beneath the skirt, oviposit in the bait (which may be a whole or dismembered carcass of a sheep) and fly up through holes in the cone towards the light that enters through the gauze at the top of the drum. Three gallons of locust poison (at a strength of 2 per cent.) is poured into the bottom of the drum to destroy any maggots dropping from the carrion.

THOMSON (J. G.). **The natural Occurrence of Flagellates of the Subgenus *Strigomonas* M. & A. Lwoff in the Gut of *Tabanus africanus* from Nyasaland and *Lucilia sericata* in England.**—*J. trop. Med. Hyg.* **36** no. 23 pp. 361–365, 1 pl., 9 refs. London, 1st December 1933.

The following is taken from the author's summary: It would appear that the flagellates isolated by Noguchi and Tilden from various insects and the latex of plants [*R.A.E.*, B **14** 133; **16** 17] have assumed in culture the morphological characters of *Strigomonas*, a recently described subgenus of *Herpetomonas*. It has been suggested that they probably belong to one species. The author has found that flagellates with the characteristics of this subgenus are extremely common in the hind-gut and rectum of *Tabanus africanus*, Gray, in Nyasaland and *Lucilia sericata*, Mg., in England, and reference to work done in America shows that they are of common occurrence there. The distribution of this flagellate is probably world-wide. The ease with which *Strigomonas* can be cultivated and its failure to reproduce the morphological characteristics of flagellates of the leptomonad (herpetomonad) type as seen in natural infections in the gut of various flies and the latex of plants strongly suggest that it is generically distinct from them. There does not appear to be sufficient proof that the various leptomonad, crithidial and trypanosome forms seen naturally occurring together in the gut of certain insects are always developmental forms of a single species of flagellate.

Corson (J. F.). **The Resistance of *Trypanosoma rhodesiense* to normal human Blood-serum in relation to Cyclical-passage through Tsetse Flies.**—*J. trop. Med. Hyg.* **36** no. 23 pp. 365–367, 11 refs. London 1st December 1933.

The following is the author's summary : An experiment showed that a strain of *Trypanosoma rhodesiense* after cyclical passage through *Glossina morsitans*, Westw., was not more resistant to the action of normal human serum, as tested *in vivo*, than after a series of mechanical passages.

Corson (J. F.). **A further Note on the Action of normal human Blood-serum on *Trypanosoma rhodesiense* in Relation to Cyclical Passage through Tsetse Flies.**—*J. trop. Med. Hyg.* **36** no. 24 pp. 378–379. London, 15th December 1933.

The trypanosomes in rats infected with *Trypanosoma rhodesiense* by cyclical transmission through *Glossina morsitans*, Westw., from guinea-pigs inoculated from man were found to be more susceptible to the action of normal human serum than those in rats infected by direct inoculation from man.

Adams (A. R. D.). **A Record of an Investigation into the Action of Sera on the Trypanosomes pathogenic to Man.**—*Ann. trop. Med. Parasit.* **27** no. 2 pp. 309–326, 3 refs. Liverpool, 7th July 1933.

During 1930–31, investigations were undertaken at Entebbe, Uganda, to determine the action of human serum *in vitro* on the trypanosomes pathogenic to man. The complete resistance of strains of *Trypanosoma gambiense* was not affected by passage through *Glossina*. The definite degree of resistance shown by strains of *T. rhodesiense* in guineapigs inoculated from man was considerably reduced after a single cyclical transmission through *G. palpalis*, R.-D., and after a second it was lowered still further. An old laboratory strain of *T. rhodesiense* maintained for 10 years in small laboratory animals without contact with fly was rapidly fatal to a native sheep when inoculated subcutaneously, and failed to infect at least 400 examples of *G. palpalis* fed on the animal at a time when its peripheral blood was shown microscopically to be positive.

Jackson (C. H. N.). **The Causes and Implications of Hunger in Tsetse-flies.**—*Bull. ent. Res.* **24** pt. 4 pp. 443–482, 4 figs., 20 refs. London, December 1933.

An account is given of studies on variations in the hunger condition of tsetse-flies carried out during recent years with a view to elucidating general problems of their behaviour. In order to make the paper more comprehensive, the results of other workers have been incorporated. Some elementary stages of the investigation and some of the methods used have already been described [*R.A.E.*, B **19** 61, 191]. Most of the data were obtained from observations on *Glossina morsitans*, Westw., but a certain amount of work was done on *G. swynnertoni*, Aust., and *G. pallidipes*, Aust., and a period of about ten days was spent in studying *G. palpalis*, R.-D., when *G. brevipalpis*, Newst., was also met with. Most of the investigations were undertaken in Tanganyika Territory, but a short visit was paid to Uganda.

The following is largely taken from the author's summary : The four stages of hunger into which tsetse-flies can be divided by their external appearance are correlated with the internal appearance determined by dissection. The fat-bodies attain maximum development shortly after a meal and thereafter diminish rapidly in bulk. Flies in different stages of hunger behaved differently in the field. Hungry flies, which were the most persistent followers, usually attacked with the head upwards, whereas replete flies, tended to adopt a head-downwards attitude, though most of them preferred to rest on the ground or on objects other than the catching party. The true habitats and feeding grounds of *G. morsitans*, *G. swynnertoni* and *G. palpalis* are described. Confirmation of the feeding-ground theory was obtained for *G. swynnertoni* by an analysis of the to-and-fro movements of marked flies. Considerable movement occurred independently of carriage on men or game, some flies travelling over 2 miles in 3 hours. The effect of physical conditions on hunger of flies is discussed. The period required for a gorged fly to become hungry was found to vary with the time of year, drier conditions shortening the cycle. Relative humidity and saturation deficiency were the factors most closely associated with changes in hunger of flies in the field ; compared with them, the abundance of game animals as determined by their seasonal migrations was of almost no account. When flies were hungrier, a greater proportion was found in the feeding grounds. Unlike the other species, *G. palpalis* apparently became hungrier during the wetter season. *G. morsitans* seems able to support itself on such small animals as bush pigs and dikdiks. Evidence is adduced to show that the classical type of concentration of *G. morsitans* described by earlier workers [**2** 96, etc.] does not differ from the types of fly distribution described by Nash [**18** 240] and the author [**19** 61]. Control of tsetse-flies by destruction of the adults proved difficult, because during the damper seasons of the year hungry flies were few and the baits were consequently little attacked. Complete game destruction would almost certainly eliminate the fly, but casual methods of destruction should be avoided until it is determined experimentally whether it can subsist on small species difficult to exterminate. Certain effects of preventing burning and of organised late annual grass-burning are discussed. A method of freeing areas of fly by separating the outer feeding grounds and the " hungry fringe " at their edge from the true habitat by means of clearings is suggested. Defoliation of trees combined with the removal of thicket proved more effective in the winter season than in the summer as a means of increasing hunger in tsetse, although to the eye the difference was much greater in summer. It is concluded from the work as a whole that catching or trapping adult flies, attempting to starve flies by reduction in the numbers of hosts, or removing the screening vegetational canopy of their environment, will, except in the case of *G. palpalis*, be really effective only in the height of the dry season, or winter.

PHILIP (C. B.). **Mosquito Species breeding in " Test " Water Containers in West Africa.**—*Bull. ent. Res.* **24** pt. 4 pp. 483–491, 4 refs. London, December 1933.

In order to determine mosquito incidence in test containers during months not covered by Dunn's study [*R.A.E.*, B **16** 27], further observations were carried out at the same place in Nigeria from June

to December 1928. Only containers of the optimum type (bamboo sections containing water and mango leaves) were used, instead of the four different types employed by Dunn, but they were placed in the same ten representative environmental situations. *Aëdes aegypti*, L., again occurred more frequently than all the other species combined. In both studies, the container situated in the shade 33 yards from the animal house was the most abundantly infested, but, contrary to previous findings, that placed in short grass in the " bush " 100 yards from the nearest human habitations was almost the least frequented, whereas the one under the laboratory, which proved least attractive in the previous study, was quite heavily infested. It is not clear whether the opposite results obtained with these two last containers were associated with protection or exposure during the two seasonally contrasting periods. Whereas Dunn stated that there was an increase in the numbers of *A. aegypti* at the beginning of the rainy season, in the present investigation the numbers were highest in December (dry season) and appeared to decrease during the period of heaviest rainfall. It is possible that population increases until an optimum amount of rainfall is reached, after which it again declines. Females of *A. aegypti*, fed on blood and kept in open screened cages provided with pads moistened with water and sugar solution, lived during the dry season for periods of 150–201 days. Moreover, females kept without blood-meals were maintained in the laboratory on water and sugar solution for 74 days between April and August.

The incidence and sex ratio of the potential vectors of yellow fever are shown in a table. Two-thirds of the total number of *A. aegypti* and one-half of *Eretmopodites chrysogaster*, Graham, were reared from the three containers near the animal houses. The other examples of the latter species, which probably seldom attacks man, were found in containers in the " bush." Few larvae of *A. africanus*, Theo, were found near animal houses and none under the laboratory ; it appeared to prefer the containers more distant from human habitations. *A. luteocephalus*, Newst., was taken in all containers except that under the laboratory and that in long grass.

KERR (J. A.). **Studies on the Abundance, Distribution and Feeding Habits of some West African Mosquitoes.**—*Bull. ent. Res.* **24** pp. 493–510, 14 refs. London, December 1933.

These investigations were undertaken to secure additional information on the habits in Nigeria of species of mosquitos that have been found to be of potential importance in the transmission of yellow fever. The data were obtained, chiefly in the vicinity of Lagos, by collecting adults during the daytime in houses, by " standard " night-catches, which consisted of all the mosquitos caught outside for three hours after sunset by a man while they were attempting to bite him (those caught during the first $1\frac{1}{2}$ hours being considered crepuscular in habit and the others nocturnal), by all-night catches, which included all mosquitos caught by two men during each hour throughout the night, and occasionally by rearing adults from larvae. Little further information is given on *Aëdes aegypti*, L. [*cf. R.A.E.*, B **21** 128], which is abundant indoors, relatively rare in night catches out-of-doors, prefers human blood and is crepuscular. The other species that definitely prefer human blood are *Mansonia africana*, Theo., *M. uniformis*, Theo., and *Culex thalassius*, Theo., which are abundant both inside and outside

houses, and *A. simpsoni*, Theo., *A. punctocostalis*, Theo., and *A. lineatopennis*, Ludl., which are scarce. Of the remaining species, which were abundant only outside human habitations, *A. luteocephalus*, Newst., *A. africanus*, Theo., *A. irritans*, Theo., *A. nigricephalus*, Theo., and *A. vittatus*, Big., probably prefer human blood, whereas *A. stokesi*, Evans, and *Eretmopodites chrysogaster*, Graham, probably prefer non-human blood. All the species mentioned have been shown to transmit yellow fever by biting [*cf.* **16** 235 ; **17** 213 ; **18** 147 ; **20** 221], except *A. irritans*, *A. nigricephalus* and *A. punctocostalis* [**18** 198], *A. uniformis* [**20** 221] and *A. lineatopennis*, which have only been shown to be capable of retaining the virus throughout their lives.

Larvae of *A. vittatus* were found occasionally in tree-holes in Ibadan. *A. irritans* was taken as far inland as Ibadan, which, although no larvae were found, suggests that it must sometimes breed in places other than crab-holes at the edges of salt or brackish water [**16** 92]. The favourite breeding-places of *E. chrysogaster* were small collections of water in fallen leaves (especially those of cacao trees) lying in moist and densely shaded places. Extended observations on seasonal incidence were only made on four species. *A. luteocephalus* and *A. africanus* showed great variations, being the most abundant species in certain places during and just after the rains and rare at the height of the dry season. The numbers of *M. africana* remained fairly constant throughout the year, except for a marked decrease during one month at the end of the dry season. *M. uniformis* reached its maximum (more than twice that of *M. africana*) in the middle of the dry season, but decreased to about a tenth of its maximum at the end of the rainy season.

With regard to the time of activity of the mosquitos that bite man frequently out-of-doors (including some additional species on which incidental data were obtained), it was found that none is active during the day, and that the members of the genus *Aëdes* are crepuscular. The other species are nocturnal ; some, including *M. africana*, *M. uniformis* and *C. thalassius*, are rather uniformly active throughout the night, others, particularly *Anopheles gambiae*, Giles (*costalis*, Theo.) and *A. hargreavesi*, Evans, have a peak of activity at midnight or later, and still others, such as *A. coustani*, Lav. (*mauritianus*, Grp.), have a crepuscular peak of activity.

THEODOR (O.). **Some African Sandflies.**—*Bull. ent. Res.* **24** pt. 4 pp. 537–547, 2 pls., 5 figs., 18 refs. London, December 1933.

The author points out that, since the introduction of the armature of the buccal cavity and the pharynx as characters for the classification of *Phlebotomus*, it has been found that variations in these characters occur in the same species from different localities and it is often difficult to decide whether these differences should be considered of specific value. For this reason he has described several local forms as varieties, although future work may necessitate their being raised to specific rank.

Chiefly on differences in the buccal armature and pharynx, the author distinguishes forms of *P. minutus*, Rond., from Palestine and India and from Mesopotamia as well as var. *signatipennis*, Newst. (North African form) from Algeria and the Sudan, var *occidentalis* n. (West African form) from the Gold Coast and Nigeria and var. *arpaklensis*, Perf. [*R.A.E.*, B **21** 96]. The identity of var. *antennatus*, Newst., is doubtful, and the author considers that Newstead [**1** 34] may have been dealing with var. *occidentalis*. However, two specimens from the Gold

Coast differed markedly from var. *occidentalis* and showed characters resembling those described by Sinton for the Indian form ascribed to var. *antennatus* [**9** 119], with which, however, it does not appear to be identical [*cf.* also **22** 11].

The form of *P. africanus*, Newst., occurring in the Belgian Congo, the Sudan and Nigeria is considered typical, the form from Palestine being described as var. *asiaticus*, n., and that from one locality in the Sudan as var. *sudanicus*, n. Other species dealt with include *P. congolensis*, Beq. & Walr. (*nairobiensis*, Thdr.) [**22** 6] with var. *distinctus*, n., from the Gold Coast and the Sudan, *P. adleri*, sp. n., and *P. buxtoni*, sp. n., from the Gold Coast, and *P. affinis*, sp. n., described from a single female from the Sudan.

HOLDAWAY (F. G.). **The Synonymy and Distribution of *Chrysomyia rufifacies* (Macq.), an Australian Sheep Blowfly.**—*Bull. ent. Res.* **24** pt. 4 pp. 549–560, 4 figs., 1 map, 2 pp. refs. London, December 1933.

The present study was undertaken with a view to clearing up the confusion that exists as to the status of *Chrysomyia rufifacies*, Macq., *C. albiceps*, Wied., and *C. putoria*, Wied. If there ever was a type of *C. rufifacies*, it is apparently no longer in existence, but from a comparison of specimens labelled "*rufifacies*" in Macquart's handwriting with the type of *C. albiceps* and with *C. putoria*, the author concludes that the species are distinct and gives a key for their separation. The type localities are Australia, the Cape of Good Hope and Sierra Leone respectively, and from an examination of a long series of the three species, a fairly accurate estimate of the distribution is given. *C. rufifacies* occurs in Australia, New Zealand, islands in the Pacific, Java, India and Ceylon ; *C. albiceps* in the Palaearctic Region, South Africa, Southern Rhodesia and islands in the Indian Ocean ; and *C. putoria* in tropical Africa. The classification of the genus *Chrysomyia* and its subgenera and groups is discussed at some length.

KUMM (H. W.). **Mosquitos breeding in Bromeliads, at Bahia, Brazil.**—*Bull. ent. Res.* **24** pt. 4 pp. 561–573, 2 col. pls., 12 figs., 6 refs. London, December 1933.

The following is substantially the author's summary : Adults were reared from 21 collections of mosquito larvae and pupae found in accumulations of water in Bromeliads, growing in trees or on the ground, in São Salvador. Four species of the subgenus *Microculex* of *Culex* and one Sabethine were reared, among which one new species (*C. davisi*) and certain new forms occurred. As *A. aegypti*, L., was not found, it would appear that breeding-places in Bromeliads are probably of no importance from the standpoint of yellow fever control in this region.

KUMM (H. W.). **The Geographical Distribution of the Yellow Fever Vectors. A Compilation of Material recorded in the Literature, unpublished Communications and certain Collections made by the Author in Nigeria, West Africa.**—*Amer. J. Hyg.* Monogr. Ser. no. 12, iv+110 pp., 19 maps, 320 refs. Baltimore, Md, July 1931. [Recd. December 1933.]

Records of the distribution, arranged so far as possible alphabetically under countries, states and localities, are given for *Aëdes aegypti*, L.,

and 11 other Culicines that had been shown up to 1931 to be capable of transmitting yellow fever by biting, *viz.*: *A. africanus*, Theo., *A. albopictus*, Skuse, *A. luteocephalus*, Newst., *A. simpsoni*, Theo., *A. vittatus*, Big., *A. stokesi*, Evans, *A. scapularis*, Rond., *A. fluviatilis*, Lutz, *A. taeniorhynchus*, Wied., *Eretmopodites chrysogaster*, Graham, and *Mansonia africana*, Theo. Under each entry is also given, where possible, a reference to the bibliography, the date of collection or report, and the name of the collector.

Davis (N. C.). **The Survival of Yellow Fever Virus in Ticks.**—*Amer. J. trop. Med.* **13** no. 6 pp. 547–554, 8 refs. Baltimore, Md, November 1933.

In the experiments described, fatal yellow fever was induced in monkeys (*Macacus rhesus*) by injection of crushed adults of *Argas persicus*, Oken, *Amblyomma cayennense*, F., or *Rhipicephalus sanguineus*, Latr., 6, 15 and 23 days respectively after they had fed on an infected monkey, of nymphs of *R. sanguineus* or of larvae of *Boophilus annulatus microplus*, Can., 10 days after, or of unidentified chicken mites 6 days after. After 28 days, adults of *A. persicus* gave rise to immunity without clinical indications of the disease. In a limited number of experiments, no evidence was secured that yellow fever virus was passed from one generation of a tick to another through the egg, that it persisted through the transformation of larva to nymph, or that it was transmitted by the bites of infected ticks at any stage.

Bliss, jr. (A. R.) & Gill (J. M.). **The Effects of Freezing on the Larvae of** *Aëdes aegypti*.—*Amer. J. trop. Med.* **13** no. 6 pp. 583–588, 11 refs. Baltimore, Md, November 1933. Also in *J. Tenn. Acad. Sci.* **8** no. 4 pp. 418–423, 11 refs. Nashville, Tenn., October 1933.

An experiment is described in which small tumblers of water containing larvae of *Aëdes aegypti*, L., were gradually cooled and maintained at −2°C. [28·4°F.] for varying periods of time. Larvae frozen for 2–10 hours recovered in 2–3 hours and completed their development in the same time as control larvae. Those frozen for 11 hours or more did not revive.

Soper (F. L.) & Serafim, jr. (J.). **Note on the Breeding of** *Aëdes* (*Taeniorhynchus*) *fluviatilis*, **Lutz, in Artificial Water Deposits.**—*Amer. J. trop. Med.* **13** no. 6 pp. 589–590, 1 fig., 3 refs. Baltimore, Md, November 1933.

Larvae of *Aëdes fluviatilis*, Lutz, which usually occur in rock pools in stream beds, were found in Espirito Santo, Brazil, on several occasions in the water of cement ant-rings protecting plants, and adults, which are experimental vectors of yellow fever [*R.A.E.*, B **19** 108], were taken in a neighbouring house. Rock-hole breeding-places of this species were found within 30 yards of dwellings, and several adults were captured with animal bait in the late afternoon.

de Verteuil (E.). **Malaria Survey for 1932.**—*Pap. Legis. Coun. Trin. Tob.* no. 32 of 1933, 27 pp., 4 pls., 5 plans, 2 graphs, 6 refs. Port of Spain, 1933. Price 2*s.* 9*d.*

A detailed account is given of further malaria survey work carried out in Trinidad and Tobago from 1st September 1931 to 31st December 1932 [*cf. R.A.E.*, B **20** 267].

From 10th to 17th November 1932, a preliminary Anopheline survey was made in the Scarborough region of Tobago. With the exception of a few larvae of *Anopheles neomaculipalpus*, Curry, *A. tarsimaculatus*, Goeldi, was the only species found. The breeding-places were numerous and dangerously close to the town and the surrounding villages, where the spleen and parasite rates were high. Breeding occurred in the brackish water of drains and swamps and along the banks of a river on a coconut estate (and to a slight extent in fresh water in the same river above the range of the tide), in stagnant pools in gullies, and in mangrove river-swamps.

Three types of mangrove swamp in which breeding occurs in the Islands are discussed. In an estuarine swamp in Trinidad (consisting of mud flats with a dense growth of mangrove on ground with a very gradual slope), *A. tarsimaculatus* breeds in the zone where the percentage of sea water is 68·7 or less (100 per cent. equatorial sea water being equal to 1·94 per cent. chlorine). The part that is of economic value is being treated by filling and by draining the fresh water through culverts discharging above the level of high tides. For small, circumscribed mangrove swamps separated from the sea by a sandbank, or for swamps at the mouths of rivers where the daily supply of water is insufficient to prevent the silting up of the mouth, both of which types are usually rendered suitable for the breeding of *A. tarsimaculatus* by the seepage of sea water through the sandbanks and débris or over the top of them at high tides, it is proposed, while filling operations are in progress, to utilise the method of regular flooding with sea water [*cf. loc. cit.*]. This is to be accomplished by means of culverts through the sandbanks discharging at low spring-tide level, so that the swamp is drained of brackish water at low tide and flooded with sea water at high tide. If necessary, small surface drains can be used to ensure the free flow of water towards the culverts. Thus it will be reasonably certain that the percentage of sea water in the swamp will be maintained at 80 or over. Provision will be made to prevent the entry of débris at the land end of the culvert and of sand at the sea end.

On a small island off Trinidad, it was found possible in a large deep pond to maintain the salinity of the water above the breeding limit of *A. tarsimaculatus* by digging a channel between the pond and the sea and subsequently opening it once a week, but in smaller, shallower swamps, more easily affected by rainfall, the salinity cannot be kept at the required level by this method, although it might be if culverts were used.

In Trinidad, *A. tarsimaculatus*, *A. albitarsis*, Arrib., and *A. neomaculipalpus* breed intensively in rice-fields from the time of planting in June–July to the time of reaping about October-November (rainy season) and *A. tarsimaculatus* also in the surrounding drains and ravines. When the banks of the rice-fields are broken down, the plots dry up rapidly. During November–January, all three species breed in the drains and neighbouring ravines and often in former plots, but less than in the rainy season. During February–June (dry season), the rice-plots and the surrounding drains are dry, and breeding is confined to ravines and streams in the vicinity. Legislation has now been enacted making provision for the enforcement of the proper maintenance of drainage channels, whether blocked owing to neglect or deliberately [*cf. loc. cit.*], the abolition of swampy areas and the prohibition of wet cultivation within certain areas. During June 1932, another migration [*cf. loc. cit.*] of *A. tarsimaculatus* occurred, but lasted only 7–10 days

instead of about 6 weeks as in 1931 ; no definite migration of the other two species was observed.

A. albitarsis is most prevalent from July to December, breeding abundantly in clear, stagnant, rain-water ponds with soft muddy bottoms and in rice plots some weeks after planting when the water has cleared. From January to July, the larvae have been found in the grassy low-lying backwash of clear streams. The adults bite freely at all times in the laboratory and have been caught in houses in small numbers in certain areas during July, September, October and December. *A. neomaculipalpus* is most prevalent from November to January, when it is found breeding in muddy-coloured, stagnant water in hoof-marks, wheel-ruts, dirty ponds and rice plots from which the rice has recently been reaped, and in June (at the beginning of the rains) in the muddy water of the rice-fields that are being prepared for planting. At these times, adults have been taken in houses and pig-sties. *A. tarsimaculatus*, which breeds permanently in brackish waters, is also found in fresh water several miles from them. Its breeding in fresh water appears to be temporary, being mostly confined to the period of intense breeding in brackish water (June to September). From October to January, it occurs only on a very small scale, in spite of the existence of numerous apparently suitable areas of fresh water, and during the dry season, from February to May, it is exceptional.

In addition to the typical form of *A. tarsimaculatus*, var. *oswaldoi*, Peryassú, which the author considers a distinct species, was also found. It was numerous in inland localities, 16–24 miles from the coast, but rare within a few miles of brackish-water areas. Curry's suggestion that *A. tarsimaculatus* var. *aquacaelestis*, described by him from Panama [**20** 93], is this form has been confirmed by F. W. Edwards, var. *aquasalis*, Curry [*loc. cit.*] being the typical *A. tarsimaculatus*.

Morin (H. G. S.) & Bader (H.). **Recherches sur quelques facteurs physico chimiques de l'oecologie des larves d'anophèles au Tonkin.** —*Ann. Inst. Pasteur* **51** no. 5 pp. 656–668, 1 map. Paris, November 1933.

A detailed account is given of investigations on the chemical composition of the natural waters in Tonkin, carried out in 1931–33 with a view to determining their influence on the breeding of Anopheline mosquitos. The only factor that appeared to show a constant correlation was the amount of free dissolved carbon dioxide, the figure for which is obtained in milligrams per litre by calculating the total content of CO_2 (free or semi-combined) and subtracting from it the amount of CO_2 corresponding to that of the sulphuric acid used to determine the " total alkalinity." This figure is known as the " carbonic index." During the cold season (north-east monsoon), indices of 50–80 were common in springs and of 15–30 in streams and rivers, whereas in the slow rivers of the fresh-water zone of the Red River delta the indices were very low and usually zero. Thus the " carbonic index," which decreases gradually from the source to the mouth of the river, corresponds to the frequency of Anopheline breeding-places, which decrease in the same manner. During the summer monsoon, when many of the streams have become small rivers and temporary streams are frequent, larvae of *Anopheles minimus*, Theo., have largely disappeared [*cf. R.A.E.*, B **21** 220 ; **22** 15] ; thus data on springs and streams are limited and of little importance. However, indices for two springs at an altitude of 4,875 ft. were 110 and 103, for two streams at 2,600 ft.

40·62 and 55 and for a stream and spring at the edge of the delta **77** and 110, thus indicating that altitude has little effect and that the " carbonic index " in real spring water and in streams near their sources remains high at all seasons. The indices in the delta, particularly in the part farthest from the sea, reach their highest point during July and August, the figures given varying from 101·84 to 23·54, a direct contrast to the low figures obtained in this region in winter. In the intermediate region, the index in general reaches a rather high minimum towards the source and a maximum near the point of entry into the delta.

MONIER (H.). **Renseignements médicaux et entomologiques recueillis sur le paludisme dans la haute vallée du Mekong.**—*Bull. Soc. Path. exot.* **26** no. 9 pp. 1144–1147. Paris, 1933.

An account is given of the malaria situation in Luang Prabang and Paklay, in the upper Mekong valley in Laos, Indo-China. In the former, about a quarter of the total morbidity is due to malaria ; in the latter, although the sickness rate appears to be lower, about 41 per cent. of the total deaths in 1928 and 36 per cent. in 1932 were attributed to this disease. In Luang Prabang, there are two peaks in the seasonal malaria incidence, that occurring in March in the second half of the dry season (November–May) being much lower than that of August–September in the middle of the rainy season (June–October). In Paklay, the incidence is highest in July–September. A mosquito survey was carried out at the end of the dry season (April), so that the breeding-places investigated were the artificial or permanent natural ones. At Luang Prabang, the larvae taken were 206 of *Anopheles vagus*, Dön., 6 of *A. kochi*, Dön., and 3 of *A. culicifacies*, Giles (apparently the only vector of malaria), which last were found in clear sunny water in the bottom of a dug-out canoe. In addition to adults of *A. vagus*, which were always the most numerous, some of *A. barbirostris*, Wulp, were also taken. At Paklay, 12 out of 56 larvae collected were *A. culicifacies* ; among the adults was a single individual of *A. jeyporiensis*, James. In this locality the chief breeding-places in the dry season appear to be the pools of water in a bank of rocks and sand, which could readily be treated by drainage and oiling.

TOUMANOFF (C.). **Recherches sur la fréquence saisonnière de diverses espèces anophéliennes au Tonkin. 4e note : *A.* (*Neocellia*) *fuliginosus* Giles, *A.* (*Neocellia*) *maculipalpis* var. *indiensis* James et Liston, *A.* (*Neocellia*) *philippinensis* Ludl.**—*Bull. Soc. Path. exot.* **26** no. 9 pp. 1167–1171. Paris, 1933.

The seasonal distribution in Tonkin of *Anopheles annularis*, Wulp (*fuliginosus*, Giles), *A. splendidus*, Koidz. (*maculipalpis* var. *indiensis*, Theo.) and *A. philippinensis*, Ludl., displays less marked variations than that of the species already dealt with [*R.A.E.*, B **21** 220 ; **22** 15]. *A. annularis* and *A. philippinensis* appear to be rare during the second half of the winter monsoon and rather more abundant during the summer monsoon. *A. splendidus* shows a slight increase in numbers during the intermediate seasons in April and October. *A. karwari*, James, appears to be extremely rare throughout the Red River basin.

Russell (P. F.). **Terminology used for *Anopheles* of the *funestus-minimus* Subgroup in recent Papers by Russell and others.**—*Philipp. J. Sci.* **51** no. 4 pp. 553–554, 6 refs. Manila, August 1933.

On the basis of W. V. King's classification of the three Anophelines of the *funestus-minimus* subgroup that occur in the Philippines [*R.A.E.*, B **20** 235], the author states that in his recent papers the name *Anopheles minimus*, Theo., referred in the first [**20** 59] to both *A. minimus* var. *flavirostris*, Ludl., and *A. mangyanus*, Banks, in the third, fourth and fifth [**21** 9, 50] to the former only, and in the second [**20** 122] to any of the Philippine members of the subgroup.

Hetherington (H. B.). **Malaria ; with special Reference to Control and Treatment.**—*Brit. Solomon Is. agric. Gaz.* **1** no. 4 pp. 9–10, 14. Tulagi, October 1933.

A brief popular account is given of malaria and its control in the British Solomon Islands, where the only Anopheline is *Anopheles punctulatus*, Dön [*R.A.E.*, B **18** 42 ; **21** 200].

Aldrich (J. M.). **Notes on Diptera. No. 6.**—*Proc. ent. Soc. Wash.* **35** no. 8 pp. 165–170. Washington, D.C., November 1933.

From a comparison of specimens, including the type, of *Oedemagena terrae-novae*, Knab, bred from caribou (*Rangifer terraenovae*) in Newfoundland, with a long series of *O. tarandi*, L., from reindeer in Alaska, the author concludes that the former is identical with, or possibly a colour form of, the latter.

Brown (E. W.). **Carboxide Gas : a new insecticidal Fumigant for Bedbugs and Cockroaches.**—*U.S. nav. med. Bull.* **31** no. 3 pp. 253–268, 3 pls., 8 refs. Washington, D.C., July 1933.

A detailed account is given of laboratory experiments to determine the minimum dose of the mixture of ethylene oxide and carbon dioxide (1 : 9 by weight) known as " carboxide " [*cf. R.A.E.*, A **20** 298] that is lethal to cockroaches and bed-bugs [*Cimex*], with a view to substituting this fumigant for ethylene oxide alone in the destruction of pests on board ship, since the concentrated vapours of the latter are inflammable [A **18** 407]. The technique of the experiments is described. The insects were confined in perforated boxes under clothing in drawers, between mattresses, etc. No experiments were carried out with eggs, but it is suggested that those of bed-bugs would probably be killed by a dose lethal to the adults, whereas against cockroaches, the eggs of which are protected by a covering, it would probably be necessary to fumigate a second time after an interval of 10 days to destroy newly-hatched individuals.

Complete mortality was obtained with the following dosages per 1,000 cu. ft. : 2 lb. in 18 and 24 hrs., 3 lb. in 6 and 12 hrs., and 5 lb. in 3 hrs. against bed-bugs, and 4 lb. in 3, 6 or 12 hrs. against cockroaches. A single experiment carried out in a ship, using 12·7 lb. per 1,000 cu. ft. and an exposure of 3 hours, gave complete ultimate mortality of the tested insects. In addition, the ship had been heavily infested with bed-bugs up to the time of the experiment, but thorough inspections 10, 21 and 30 days afterwards gave negative results and afford presumptive evidence of the destruction of eggs. The ultimate effect of the fumigant on both insects was usually much greater than that indicated by examination immediately after exposure.

MINK (O. J.). **Mosquito Control in Haiti.**—*U.S. nav. med. Bull.* **31** no. 3 pp. 323–334, 1 ref. Washington, D.C., July 1933.

A detailed account is given of the mosquito incidence and the larval control measures undertaken in the vicinity of Port-au-Prince during the fiscal year 1931–32. A list is given of the 14 species of mosquitos found, with notes on their breeding-places ; it includes, in addition to those already noticed [*R.A.E.*, B **20** 1], *Anopheles albimanus*, Wied. (the only vector of malaria), *A. grabhami*, Theo., and *Psorophora pygmaea*, Theo. Certain mosquitos, particularly *P. pygmaea* and *Aëdes taeniorhynchus*, Wied., are very abundant at times in the flat country close to the shore and in the salt marshes. They breed prolifically, bite fiercely and are capable of flying 4–5 miles. Large numbers of these mosquitos, with a certain number of Anophelines, migrate into the city at intervals during the rainy season, which in 1931 and 1932 was unusually heavy and lasted from April to December. The discovery of their main breeding-places and the gradual extension of control measures applied to them brought about a decrease in the incidence of *Anopheles albimanus* and of malaria in the city as the rainy season advanced. Observations in Haiti confirm the fact that *A. albimanus* thrives only in water reached by sunlight ; in deeply shaded sugar-cane fields, however, it was found in pools in irrigation ditches where enough sunlight filtered through small openings in the dense cane to allow of the growth of algae.

An implement known as the " Panama whale " is of great assistance in treating open ditches that need constant supervision and maintenance. Made of native rope, with a 30 lb. weight in the front end, it is saturated with oil, and when dragged along the ditch it smooths and grooves in one operation and leaves enough oil behind to kill mosquito larvae. A mixture of 5 per cent. crude cresol, 10 per cent. kerosene and 85 per cent. Diesel engine oil atomised in latrines was found to be the most suitable larvicide and deodorant. By applying control measures to vast areas in and near the city and by oiling latrines, mosquitos have been noticeably reduced ; in the previous year there had been an epidemic of malaria, but in the year under review only a few scattered cases occurred. Oil was generally employed for control, but where only Anophelines were to be dealt with, a 3 per cent. mixture of Paris green and lime was used. Almost every type of drainage problem is present in Port-au-Prince and its environs, and numerous kinds of surface and subsurface drains are discussed. With a view to making Anopheline control as nearly automatic as possible, the drains installed have been of the type that will permit the larvae and pupae to be washed out to sea or into the larger and more permanent ditches, where they are destroyed by fish. Wherever possible, especially within the city limits, drains of the closed subsurface type have been used ; these have to be laid at a depth of at least 30 inches to intercept the water and to avoid blockage by roots.

ESCALAR (G.). **Applicazione sperimentale della zooprofilassi in Ardea.** [The experimental Application of Zooprophylaxis at Ardea.]—*Riv. Malariol.* **12** fasc. 2 pp. 373–380, 1 map. Rome, 1933. (With Summaries in Italian p. 448, French p. 451, English p. 453, German p. 456.)

The experiment described was made at a village in the Roman Campagna of 24 dwellings, several hundred inhabitants and an area of

approximately 700 yards by 300. In spite of anti-malarial measures, including those against Anophelines, 23·6 per cent. of the population were infected with malaria in 1929, 46·7 in 1930 and 32·26 in 1931, all being cases of malignant tertian [*Plasmodium falciparum*].

In May and June 1932, a belt of 20 pig-sties was established round the village. Each was built of masonry, with a door, always open, facing south and another door, nearly always closed, facing north, without windows, and with a space between the ceiling and the roof to prevent the former from being overheated.

From May to December 1932, 21,908 Anophelines were captured in the pig-sties and 2,368 in the dwellings, whereas during the same period in 1931, 1,435 had been taken in 3 existing pig-sties and 3,356 in the dwellings. Thus 70 per cent. of the total were taken in dwellings in 1931, and only 9·7 per cent. in 1932. The numbers in the various months are given, the highest being in August and September, the most malarious season. From October to December, the catches decreased in the pig-sties and increased in the dwellings. The grey-egg race of *Anopheles maculipennis*, Mg. (var. *labranchiae*, Flni.) was the predominant local form. Of 139 engorged females taken in the pigsties and examined, 97 had fed on pigs and none on man.

The protection afforded was confirmed by the reduction in the percentage of the population infected with malaria, which was only 8·94 for the whole of 1932, though in other localities of the district the disease was more prevalent than it had been in 1931.

Pecori (G.) & Escalar (G.). **Relazione sulla campagna antimalarica nell'Agro Romano durante l'anno 1932.** [Report on the Campaign against Malaria in the Roman Campagna in 1932.]—*Riv. Malariol.* **12** fasc. 5 pp. 901–903. Rome, 1933. (With Summaries in Italian p. 1058, French p. 1062, English p. 1065, German p. 1067).

Brief reference is made to the experiment noticed in the preceding paper, and the general importance of stabled animals in attracting *Anopheles maculipennis*, Mg., and so preventing infection with malaria is emphasised.

De Benedetti (A.). **Nota su di una modificazione per migliorare il funzionamento ed il rendimento delle macchine soffiatrici usate per lo spandimento del verde di Parigi.** [A Note on a Modification improving the Working and Efficiency of the Dusters used for distributing Paris Green.]—*Riv. Malariol.* **12** fasc. 5 pp. 897–900, 1 fig. Rome, 1933. (With Summaries in Italian p. 1058, French p. 1061, English p. 1064, German p. 1067.)

This improvement to knapsack dusters used for applying Paris green against Anopheline larvae consists in the introduction of a metal plate above the blower mechanism proper. This plate becomes the bottom of the dust store chamber and is pierced with three or four holes about $\frac{1}{8}$ inch in diameter. The dust percolates through the holes into the blower chamber, and it is thus distributed in a more uniform and economical manner than when (as previously) it is packed round the blower.

Swellengrebel (N. H.). **Malaria in Deltas. Studies on Malaria in the Rhine Delta.**—*Riv. Malariol.* **12** fasc. 5 pp. 953–979, 6 figs., 2 pp. refs. Rome, 1933. (With Summaries in Italian p. 1059, French p. 1062, English p. 1065, German p. 1068.). Also in French as : *C. H. Malaria* 208 pp. 1–32, 6 figs., 2 pp. refs. Geneva, Société des Nations, September 1933.

As the deltas of the Rhine, Meuse and Scheldt overlap and the distribution of *Anopheles maculipennis* var. *atroparvus*, van Thiel, the sole vector of malaria in this region, is regulated entirely by conditions obtaining in them, the problem dealt with is in reality that of malaria in Holland as a whole. Present knowledge on this subject is reviewed. Since the previous report [*R.A.E.*, B **12** 174 ; **13** 38], it has been discovered that the name *A. maculipennis*, Mg., has been used to designate two races, var. *atroparvus* and var. *messeae*, Flni. [but *cf.* **21** 212] that are distinguished primarily by the biological characters of " gonotrophic dissociation " and " gonotrophic concordance " respectively [**18** 52]. As the ability to transmit malaria is due to the character of " gonotrophic dissociation," the disease occurs chiefly in those regions where there are small areas of brackish water to which the breeding of var. *atroparvus* is practically confined. Large surfaces of brackish water, such as broad canals and vast lakes, are not dangerous, but in the system of land reclamation by means of " polders," in which the water is pumped out of an area surrounded by dikes, the level of the ground is not raised, the surface water is rendered brackish by the infiltration of sea water, and var. *atroparvus* breeds in the narrow ditches. Thus " polders " protect the " hinterland " from seepage of sea water, but only by creating fresh breeding-places in the newly reclaimed areas. In the present scheme for the reclamation of the Zuyder Zee, this is to be avoided by converting the unreclaimed portion in the middle of the new " polders " into a large lake of fresh water fed by the Ysel and protected from the sea by an embankment, which will, it is hoped, ensure that the surface water of the new " polders " will gradually lose its salinity.

Cantacuzène (J.), Ottolenghi (D.), Pittaluga (C.) & Swellengrebel (N. H.). **General observations on Malaria in Deltas.**—*Riv. Malariol.* **12** fasc. 5 pp. 980–984. Rome, 1933. (With Summaries in Italian p. 1059, French p. 1062, English p. 1065, German p. 1068.) Also in French as : *C. H. Malaria* 208 pp. 33–39. Geneva, Société des Nations, September 1933.

After briefly discussing the investigations that have been carried out in deltas, the authors conclude that, although such areas present conditions favourable for the breeding of Anophelines, they do not necessarily become malarious on the advent of man. The incidence of the disease appears to increase in proportion to the population, not only directly but as a result of the need for a more intensive cultivation, with the consequent creation of rice-fields [*cf. R.A.E.*, B **21** 227], the reclamation of land by means of " polders " [see preceding paper], the protection of land already under cultivation by means of embankments [**20** 72], and the seasonal introduction of possibly susceptible labour at the time of harvest [**21** 227].

Boynton (W. H.) & Woods (G. M.). **Deer as Carriers of Anaplasmosis.** —*Science* **78** no. 2033 pp. 559–560, 1 ref. New York, 15th December 1933.

In experiments in the United States, a few bodies resembling *Anaplasma* were found in the blood of a southern black-tailed deer that had been in a very weak condition and heavily infested with ticks (*Dermacentor reticulatus occidentalis*, Marx, *D. parumapertus*, Neum., and *Ixodes ricinus californicus*, Banks) but had quickly recovered after they had been removed. Blood from this animal injected into others did not, however, produce anaplasmosis until after the deer had itself received an injection of infected blood, when one out of two attempts to transmit the disease was successful. In a mule deer no traces of *Anaplasma* were observed, but after it had received injections of infected blood, the disease was transmitted from it by subinoculation. After being infected, neither of the deer developed symptoms or blood changes characteristic of anaplasmosis, but since deer in the wild state harbour a variety of ticks, some of which have been found to be vectors, these animals may be a potential source of infection.

[Beklemishev (V. N.).] **Беклемишев (В. Н.). Woher stammen geflügelte Anophelen in einem durch Flugzeugbestaubung geschützten Gebiete ?** [Whence come adult Anophelines in Areas that have been subjected to Avio-chemical Treatment ?] [*In Russian.*]—*Med. Parasit. parasit. Dis.* **2** no. 1–2 pp. 53–59, 1 graph. Moscow, 1933. (With a Summary in German.)

In a rice-growing area to the north of Lake Balkash in south-eastern Kazakstan, Paris green was applied by aeroplane to all the rice-fields and adjoining marshes, etc., at intervals throughout the summer of 1932 for the control of *Anopheles maculipennis*, Mg. In August, however, adults of this mosquito were present in all villages, though no larvae could be found. The mosquitos were most numerous in the houses nearest to the rice-fields, and so had almost certainly not come from some other breeding-place that had been overlooked during the dusting operations. The preceding applications of dust had been made on 19th July and 10th August, and by calculating the duration of the life-cycle of the mosquito in comparison with the average temperature of the water, it was evident that a generation had matured in the interval, the pupae being unaffected by the dust. The maximum duration of the life of the females in August in this district was found to be 20 days. In a neighbouring district where dust applications in August had been correlated with larval development, hardly any adult Anophelines occurred from September to the end of the year. In districts where control was not applied, the mosquitos were abundant in houses in September and malaria was severe. It is concluded that the position of breeding-places can be determined from the places in which adult mosquitos are found in the day-time.

[Nabokov (V. A.), Goryainov (A. A.) & Bekman (A. M.).] **Набоков (В. А.), Горяинов (А. А.) и Бекман (А. М.). Arsmal (arsenite de cuivre)—nouvelle préparation pour la lutte contre les larves d'anophèle.** [*In Russian.*]—*Med. Parasit. parasit. Dis.* **2** no. 1–2 pp. 59–65. Moscow, 1933.

Laboratory experiments were carried out in Moscow to find a preparation that would be as effective as Paris green for the control of Anopheline larvae but would contain smaller amounts of the costly arsenic

and copper. Of a number of dusts tested, the best results were obtained with calcium arsenite dusts containing 31·38–52·39 per cent. arsenic, which killed all the larvae when applied at a rate equivalent to 0·9 lb. per acre. Special attention was, however, devoted to copper arsenite dusts with low contents of arsenic trioxide and copper oxide. They were prepared with white arsenic, hydrated copper sulphate and chalk so that copper arsenite was formed on the chalk particles, each of which was impregnated with the poison. At a rate of 0·9 lb. per acre, the dust containing 8·86 per cent. arsenic invariably killed all larvae of *Anopheles maculipennis*, Mg., of all instars ; complete mortality was not obtained when the rate of application or the arsenic content of the dust was decreased. The addition of " acidol " [no definition of which is given] increased the efficiency of the dust, causing it to form a rather resistant film that remained on the surface of the water for 36–48 hours ; when the dust was used alone, 33–50 per cent. of the particles soon sank to the bottom, and the remainder did not float for longer than 24 hours.

These laboratory results were confirmed by preliminary field experiments in peat bogs near Moscow in which each larvicide was mixed with peat dust (1 : 9) to secure a more even distribution and applied to isolated pits. The best results were obtained with the copper arsenite dust containing 8·56 per cent. arsenite and 6·56 per cent. copper oxide ; at the rate of 0·9 lb. per acre, it killed all the larvae, whereas calcium arsenites containing 20 and 30 per cent. arsenic killed 37·5–88 and 87–88 per cent. respectively.

In experiments on the application of copper arsenite from an aeroplane, the width of the cloud of dust released was as great as that of Paris green ; mixed with peat dust (1 : 1), it remained suspended in the air for a long time and was evenly distributed on the surface of the water. Though it was kept for a damp night in receptacles that were not hermetically sealed, it did not show any tendency to absorb moisture and could be easily mixed with peat dust. No material remained in the dusting apparatus and there was no clogging.

[Zhukov (N. M.) & Krasikova (V. I.).] **Жуков (Н. М.) и Красикова (В. И.). L'action du plasmocide sur l'infectibilité de l'***Anopheles maculipennis* **par le** *Plasmodium vivax* **et** *P. falciparum*. [*In Russian.*]—*Med. Parasit. parasit. Dis.* **2** no. 1–2 pp. 65–72, 2 graphs, 6 refs. Moscow, 1933.

A detailed account is given of investigations on the infection of *Anopheles maculipennis*, Mg., with malaria after feeding on the blood of gametocyte carriers who were treated (six times in 24 hours) with plasmocide, a new synthetic drug.

Mosquitos were fed on the patients before the administration of plasmocide, and two hours after each treatment. The percentages of mosquitos infected with *Plasmodium vivax* were 72·7 before and 18·3 after the first administration, and 0 after the sixth. The corresponding figures in the case of *P. falciparum* were 13·3, 9·3 and 0. The drug did not reduce the numbers of gametocytes in the blood, but apparently deprived them of the power of reproducing in the stomach of the mosquito. The mosquitos that were infected after feeding on treated patients showed a decrease in the numbers of oöcysts and sporozoites as compared with the controls.

The authors believe that plasmocide treatment may be used to prevent the transmission of malaria even from gametocyte carriers

infected with *P. falciparum* and consider it equal in effectiveness to plasmochin in this respect [*cf. R.A.E.*, B **17** 246 ; **18** 258 ; **20** 256 ; **21** 271 etc.].

KINGSBURY (A. N.). **Annual Report of the Institute for Medical Research (F.M.S.) for the Year 1932.**—Med. 8vo, 108 pp. Kuala Lumpur, 1933.

Some of the work of entomological interest in this report has already been noticed [*R.A.E.*, B **21** 254]. In experiments by R. Green during 1932 on the feeding of various mosquitos on human gametocyte carriers, the following were infected with *Plasmodium falciparum* : *Anopheles hyrcanus* var. *nigerrimus*, Giles (3 out of 76), *A. kochi*, Dön. (3 out of 13), *A. maculatus*, Theo. (5 out of 88), *A. philippinensis*, Ludl. (3 out of 36), *A. subpictus* var. *malayensis*, Hack. (4 out of 19) and *A. vagus*, Dön. (1 out of 46). The seasonal variation in numbers of Anophelines caught at Kuala Lumpur in a mosquito net trap with man as bait [*cf.* **21** 147] is shown in a table. Larval surveys made throughout the year in the same locality did not support the theory of inverse density of larvae and adults ; in several cases there was a close correlation between their numbers. All the mosquitos caught in a similar trap on a rubber estate and a large number of those taken in the Kuala Lumpur trap were dissected ; the only salivary gland infections were found in females of *A. maculatus*. Figures obtained from precipitin tests support the view that this mosquito shows a greater avidity for human blood than other Anophelines, which, although easily infected under laboratory conditions and widely distributed, rarely carry malaria in nature.

SALEM (H. H.). **New Records of some Egyptian Mosquitoes.**—*Bull. Soc. roy. ent. Egypte* 1933 fasc. 1–3 pp. 83–92, 1 fig., 22 refs. Cairo, 1933.

Notes are given on the distribution of mosquitos collected in Egypt between January 1932 and February 1933, which included *Anopheles coustani* (*mauritianus*) var. *tenebrosus*, Dön., *A. pharoensis*, Theo. (the egg of which is illustrated), *A. multicolor*, Camb., *A. superpictus*, Grassi, *A. sergenti*, Theo., and *A. algeriensis*, Theo., which is recorded for the first time from Egypt. Different stages of *Plasmodium vivax* up to the mature oöcyst were demonstrated in experimentally infected females of *A. pharoensis*. Dissections of females of *Culex pipiens*, L., taken in a locality where it is the most abundant mosquito and where filariasis and elephantiasis are endemic, revealed the presence of active larval forms of *Filaria* (*Wuchereria*) *bancrofti* in the muscles of the thorax [*cf. R.A.E.*, B **20** 159].

PAPERS NOTICED BY TITLE ONLY.

STALEY (J.). **Larval Distinctions between** *Anopheles algeriensis* **Theobald and** *Anopheles claviger* (*bifurcatus*) **Meigen (Dipt., Culicidae).** —*J. ent. Soc. S. Engl.* **1** pt. 4 pp. 85–86. Southampton, 16th December 1933. [*Cf. R.A.E.*, B **21** 24.]

GOETGHEBUER [M.]. **Catalogue des Cératopogonoides de Belgique.**—*Bull. Ann. Soc. ent. Belg.* **73** no. 11 pp. 363–372. Brussels, 30th November 1933.

Brumpt (E.). **Recherches expérimentales sur la myiase des batraciens provoquée par la mouche** *Lucilia bufonivora*.—*C. R. Acad. Sci. Fr.* **197** no. 26 pp. 1777–1779, 6 figs. Paris, 1933.

Heim de Balzac (H.). **Note sur le comportement de** *Lucilia bufonivora* **Monniez.**—*Bull. Soc. ent. Fr.* **38** no. 15 pp. 236–239, 7 refs. Paris, 1933.

Cousin (G.). **La diapause chez** *Lucilia bufonivora*.—*Bull. Soc. ent. Fr.* **38** no. 16 pp. 261–264, 10 refs. Paris, 1933.

Nicolle (C.), Laigret (J.) & Giroud (P.). **Passage des virus exanthématiques par voie digestive chez le rat. Importance de cette voie dans la transmission naturelle des typhus murins.**—*Arch. Inst. Pasteur Tunis* **22** no. 3 pp. 326–337. Tunis, 1933. [*Cf. R.A.E.*, B **21** 217.]

Anderson (C.) & [Vasil'ev] Wassilieff (A.). **Sur un nouveau spirochète récurrent du type** *hispanicum* **rencontré chez** *Ornithodorus erraticus* **du Sud-Tunisien.**—*Arch. Inst. Pasteur Tunis* **22** no. 3 pp. 350–363, 1 map, 6 graphs, 2 refs. Tunis, 1933. [*Cf. R.A.E.*, B **21** 244.]

Roubaud (E.) & Colas-Belcour (J.). *Argas boueti*, **nouvelle espèce d'ixodidé parasite des chauve-souris au Soudan français.**—*Parasitology* **25** no. 4 pp. 472–477, 1 pl., 6 figs. Cambridge, December 1933.

Schulze (P.). **Die Arten der Zeckengattung** *Dermacentor* **s.l. aus Europa, Asien und Neu-Guinea** [including new species and subspecies and one new genus].—*Z. Parasitenk.* **6** no. 3 pp. 416–431, 13 figs., 15 refs. Berlin, December 1933.

Schulze (P.). **Neue und wenig bekannte deutsche** *Ixodes*-**Arten.**—*Z. Parasitenk.* **6** no. 3 pp. 432–437, 8 figs., 7 refs. Berlin, December 1933.

Hase (A.). **Ueber die Lauterzeugung sowie deren mutmassliche Bedeutung bei der Wanze** *Panstrongylus*, **Hemiptera U. Familie Triatomidae.** [On Sound Production and its possible Meaning in the Bug, *Panstrongylus geniculatus*, Latr.]—*Biol. Zbl.* **53** no. 11–12 p. 607–614, 2 figs., 14 refs. Leipzig, 1933.

Strand (A. L.). **A Chronological Summary of the Investigations on Rocky Mountain Spotted Fever with especial Reference to the Work in Montana.**—*Bienn. Rep. Mont. St. Bd Ent.* **9** (1931–32) pp. 18–47, 13 pp. refs. [Bozeman, Mont., 1933.]

Bequaert (J. C.). **The Templeton Crocker Expedition of the California Academy of Sciences, 1932. No. 11. The Hippoboscidae of the Galapagos Archipelago (Notes on the Hippoboscidae 8.) with an Appendix on the Tabanidae.**—*Proc. Calif. Acad. Sci.* (4) **21** no. 11 pp. 131–137. San Francisco, 21st December 1933.

Hardy (G. H.). **Miscellaneous Notes on Australian Diptera. I.** [Including key to Australian *Pelecorrhynchus* and 2 new species].—*Proc. Linn. Soc. N.S.W.* **58** pt. 5–6 pp. 408–420, 4 figs. Sydney, 15th December 1933.

[Vasil'ev] Wassilieff (A.). **Les rongeurs et puces de Tunisie et leur rôle dans la propagation de la peste. IV. La receptivité comparée des divers rongeurs tunisiens vis à vis de la peste.**—*Arch. Inst. Pasteur Tunis* **22** no. 3 pp. 443–476, 18 refs. Tunis, 1933.

Over the greater part of Tunisia the rodent fauna consists chiefly of *Meriones*, particularly *M. shawi*, but in the south, where plague has never been recorded, this species is replaced by *Psammomys roudairei* [*cf. R.A.E.*, B **21** 69]. Inoculation experiments with these and other small rodents to test their relative susceptibility to plague showed that *Psammomys* and *Jaculus* are the most susceptible, the other rodents more or less so and *Meriones* almost entirely refractory. Tests of the surviving *Meriones* failed to reveal the presence of plague bacilli, and it is concluded that these rodents cannot be regarded as a factor in either the maintenance or the spread of the disease. Thus, the region in Tunisia where outbreaks of plague occur is inhabited by rodents that are not susceptible to infection, and the author therefore considers that these outbreaks are of human and not animal origin, and that there are no foci of plague among the wild rodents, such as occur in South Africa and Russia [**17** 70, etc.]. He points out, however, the danger of the introduction of plague into the south, where the wild rodents are susceptible, and recommends that a constant watch should be kept for mortality among these animals, particularly along the frontier of Tripolitania. The great importance of fleas as a reservoir of plague bacilli is discussed and exemplified [*cf.* **18** 269 ; **21** 160, etc.].

Mitchell (W. C.) & Cobbett (N. G.). **Field Investigations relative to the Control of** *Oestrus ovis*.—*J. Amer. vet. med. Ass.* **83** (N.S. **36**) no. 2 pp. 247–254, 2 figs., 2 refs. Chicago, Ill., August 1933.

Investigations in western Texas and eastern New Mexico during the spring and summer of 1932 showed that *Oestrus ovis*, L., is prevalent, 87 and 97 per cent. respectively of the sheep examined being infested. From 1 to 40 larvae were found in individual animals, all stages of larval development often being observed in a single head. In the majority of cases, the first-instar larvae appear to migrate from the nasal passages to the frontal sinuses for further development ; infestation of the maxillary sinuses was seldom observed. There was no evidence suggesting that *O. ovis* is responsible for the death of sheep in large numbers, but it causes excessive nasal discharge with accompanying ill effects. Pathological changes in the tissues were seen in cases in which maggots had died in the head cavities, and for this reason the authors question the value of treatments intended to kill them in the head. Observations confirmed previous reports that the attacks of the adult fly interfere with the proper feeding and management of sheep. Thorough application of commercial pine-tar oil to the noses of sheep twice a week had little repellent effect on the female flies. An apparatus for automatically applying it to the noses of sheep visiting a salt-trough, which shows some promise, is described. The desirability of finding more effective repellents is indicated.

Dove (W. E.) & Cushing (E. C.). **Warble Injuries to Reindeer Hides. Migration of Warbles in Reindeer. (Abstracts.)**—*J. Parasit.* **20** no. 2 p. 138. Lancaster, Pa, December 1933.

In the first paper, it is stated that observations on the injuries caused to reindeer by the Oestrid, *Oedemagena tarandi*, L., in Alaska show that in

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order to produce undamaged skins it is necessary to prevent infestation by the young larvae and to allow more than a year for the healing of injuries resulting from old cysts. In the second, it is recorded that work on the migratory larvae confirms previous findings that the larvae are found in the connective tissues below the skin [*R.A.E.*, B **15** 210] and not in the vicinity of the oesophagus, and suggests that when they have entered the skin they migrate upwards in the connective tissues [*cf.* **11** 120; **14** 214]. They do not, therefore, apparently work so extensively as do *Hypoderma* in cattle. In at least one case, it was demonstrated that a larva remained in the subcutaneous tissue near a hair follicle for 26 days before migrating.

PROUTY (M. J.) & COATNEY (G. R.). **Further Studies on the Biology of the Pigeon Fly,** *Pseudolynchia maura* **(Diptera, Hippoboscidae). (Abstract.)**—*J. Parasit.* **20** no. 2 p. 139. Lancaster, Pa, December 1933.

In further experiments [*cf. R.A.E.*, B **20** 19], *Pseudolynchia maura*, Big., which attacks pigeons, was found to be positively thermotropic and thigmotropic and negatively phototropic and hydrotropic. The length of life without food is in direct proportion to the energy expended in motion, occupying 77–109 hours. The flies did not feed except through a membrane and when the materials were heated to body temperature. Experiments with various foods gave inconclusive results.

HEARLE (E.). **Notes on a serious Outbreak of Tick Paralysis in Cattle.**—*Proc. ent. Soc. Brit. Columbia* no. 30 pp. 11–16. Victoria, B.C., March 1933. [Recd. December 1933.]

Extensive outbreaks of tick paralysis in cattle are apparently extremely rare, but in British Columbia in April 1930 about 100 animals were affected (of which over 65 died) in a herd of 900 yearling steers, as the result of infestation by *Dermacentor venustus*, Banks (*andersoni*, Stiles) [*R.A.E.*, B **21** 153]. Apart from the actual mortality, the herd was weakened by driving and handling during control measures. The symptoms are described, and the prevailing weather conditions, the type of pasture on which the cattle were feeding and the rodents present are discussed. No outbreak had been recorded on this range for the previous 15 years ; and none has been observed since 1930, but only horses or mature cattle have been placed on it during the tick season. Cattle on an adjacent and somewhat similar area were not affected and, in spite of an unusual abundance of ticks, the number of cases of paralysis in man or cattle reported throughout the dry belt was lower than usual. Each animal was attacked by an average of about 150 ticks, which chiefly occurred at the back of the head and along the neck and shoulders down to halfway along the back-bone. The larger engorged ones were collected by hand, and the affected areas were treated with raw linseed or raw cottonseed oil, together with pine-tar oil, which proved more satisfactory than a mixture of 4 gals. kerosene, 10 lb. lard and 2 lb. sulphur, which tended to cause blistering. Many animals recovered 24 hours after treatment, but others in more advanced stages of paralysis died within 2–3 days.

Serious secondary injury was caused by *Phormia regina*, Mg., which commonly produces myiasis in sheep and cattle in British Columbia. Maggots were numerous on about 65 of the paralysed steers ; thousands

were observed in areas affected by the tick, and vertebrae and shoulder bones were exposed in some cases. The injuries sustained by the weakened animals in their attempts to rise and their helpless condition, which prevented them from keeping off the flies, appeared to render them more liable to attack. The application of pine-tar oil was recommended to protect them from infestation, and it was advised that carcasses should be soaked in creosote, where it was impracticable to burn or bury them, to prevent the breeding of the fly.

MURASHIMA (T.). **Prevalence of House Ticks in Kanagawa Prefecture and their Destruction.**—*J. publ. Hlth. Ass. Japan* **9** no. 8 pp. 1–4. Tokyo, August 1933.

A brief account is given of the history of the distribution of *Liponyssus nagayoi*, Yam. [*cf. R.A.E.*, B **19** 156] in the Kanagawa Prefecture, Japan. As mites of this species were found in a ship that arrived at Yokohoma in 1926, the author believes that they were originally introduced on man or rats or in merchandise from some foreign country. They first appear with the onset of warm weather in May and increase in numbers with the rise in temperature ; in 1931 and 1932, they were most abundant in July. They are found in damp, dark, ill-ventilated situations in association with rats. They are sometimes seen moving in large numbers over ceilings and pillars, whence they descend at night to the floor to feed on man. In infants any part of the body is attacked, and in adults those parts where the skin is thinnest such as the lower abdomen and the thighs.

To control the mites, rats should be destroyed and their nests burned, infested situations should be cleaned, clothing and bedding should be exposed to sunlight and rooms sprayed with benzene mixed with crude cresol, carbon tetrachloride or paradichlorobenzene.

CORDIER (C.). **Du rôle des insectes dans la transmission du cancer.**—*Rev. Zool. agric* **32** no. 8 pp. 133–135. Bordeaux, 1933.

The author reviews a paper that appeared in "Journées d'études biologiques du cancer" (Bordeaux, July 1933) by Romary, who, as a result of extensive investigations at Marseilles, puts forward the hypothesis that the causal organism of cancer is *Entamoeba blattae*, which infests cockroaches and has hitherto been regarded as saprophytic. With regard to the supposed connection of *Gongylonema* with the disease [*cf. R.A.E.*, B **12** 128; **13** 156, etc.], it is suggested that these Nematodes cause the lesions through which *E. blattae* obtains an entrance. If this hypothesis is correct, it would seem that the chemotheraphy used in the treatment of other protozoal diseases should be of value, and, in fact, the use of quinostovarsol has already caused improvement in cases regarded as incurable and in certain cases prolonged survival and apparently permanent cures. Prevention consists essentially in the destruction of cockroaches and the protection of goods from contamination by these insects. It would appear that cockroaches are repelled by magnesium chloride.

He also gives the summary of a paper in the same publication by Pierlot entitled " Les cages à cancer dans l'élevage des souris," in which it is concluded that bed-bugs [*Cimex*] infesting cages in which mice showed an abnormally high percentage of cancer infection were responsible for the spread of the disease.

Pinto (C.). **Profilaxia das doenças infecciosas e parasitarias dos animais domesticos do Brasil.** [The Prophylaxis of infectious and parasitic Diseases of the domestic Animals of Brazil.]—Super Roy. 8vo vi+308 pp., 93 figs., 26 pls., 1 fldg table. Rio de Janeiro [Minist. Agric.], 1933. Price not stated.

This collection of lectures on the prophylaxis of diseases of domestic animals and poultry in Brazil deals with 15 diseases due to bacteria, 10 to filtrable viruses, 8 to Protozoa, 4 to fungi, 14 to helminths and 7 directly to Arthropods, some of the others being transmitted by Arthropods the control of which is an essential measure. Among the original illustrations is a figure of the Cimicid, *Ornithocoris toledoi*, Pinto, infesting fowls [*R.A.E.*, B **18** 20] and a coloured plate of *Neivamyia lutzi*, Pin. & Fons. [*cf.* **21** 263, etc.].

Mer (G.). **Observations on the Development of *Plasmodium malariae* Lav. in *Anopheles elutus* Edw. Experimental Transmission of Quartan Malaria to Man from the Mosquito.**—*Ann. trop. Med. Parasit.* **27** no. 4 pp. 483–488. Liverpool, 20th December 1933.

The experiments described were carried out in the Huleh area, Palestine, where quartan malaria predominates throughout the year, during the summers of 1932 and 1933, as local observations had shown that new infections occur between June and October. Laboratory-bred females of *Anopheles sacharovi*, Favr (*elutus*, Edw.) were allowed to bite gametocyte carriers infected with *Plasmodium malariae* and were subsequently kept in a moist room, fed on raisins or on man and dissected at varying intervals. The development of the oöcysts of *P. malariae* in *A. sacharovi* is described and compared with that of *P. falciparum* and *P. vivax* in the same species. The salivary glands are invaded after 28 days at a temperature of 23–26°C. [73·4–78·8°F.], as compared with 17–18 days in the case of the other two parasites. The sporozoites of *P. malariae* are more active than those of the other two. Three men were infected by the bites of infected mosquitos, and the development of the parasite was studied in one of them.

Gibbins (E. G.) & Loewenthal (L. J. A.). **Cutaneous Onchocerciasis in a *Simulium damnosum*-infested Region of Uganda.**—*Ann. trop. Med. Parasit.* **27** no. 4 pp. 489–496, 1 map, 25 refs. Liverpool, 20th December 1933.

Investigations on cutaneous onchocercosis in a village near Jinja, Uganda, revealed the fact that nearly all the inhabitants were affected by lichenification in various stages. Of 112 adults of *Simulium damnosum*, Theo., caught in the act of biting, 48 were dissected ; 7 showed embryos of *Onchocerca volvulus* in the thoracic muscles, and in one of these there were also 2 active Nematodes in the head. Some of the 54 patients seen at Kampala attributed the disease to *S. damnosum*, and a comparison of the distribution of the cases with that of the fly showed that they almost coincided. In one of the districts from which the cases were derived, adults of *S. damnosum* were active ; in one locality, 15 out of 33 caught biting the inhabitants were dissected and 2 were found to be infected in the gut ; in another, 12 out of the 37 captured were dissected but none was infected. During a visit to an island in Lake Victoria where, although *S. damnosum* is absent, *S. adersi*, Gibbins (MS), is present at certain seasons, no flies were taken and no cases of lichenification were observed. It is by no means

certain that all such symptoms are due to the microfilariae of *O. volvulus*, as cases were observed that were clinically indistinguishable from cutaneous onchocercosis, but in which the thickening of the skin had apparently followed other forms of itching dermatitis, such as scabies. In these persons, who had not resided in areas infested with *S. damnosum*, no subcutaneous nodules and no larvae were found. It is just possible that the skin changes in onchocercosis are due to long-standing attacks by *Simulium*, the bites of which may irritate for a week.

Cushing (E. C.) & Patton (W. S.). **Studies on the Higher Diptera of Medical and Veterinary Importance. *Cochliomyia americana* sp. nov., the Screw-worm Fly of the New World.**—*Ann. trop. Med. Parasit.* **27** no. 4 pp. 539–551, 7 figs., 3 refs. Liverpool, 20th December 1933.

Both sexes of *Cochliomyia americana*, sp. n., are described from Texas, and their terminalia are compared with those of *C. macellaria*, F., the two species being otherwise practically indistinguishable. The adults were reared from larvae that developed in the wounds of cattle, from which *C. macellaria* was not obtained, and it is suggested that the new species is in reality the one that produces myiasis and that *C. macellaria*, which was taken from blow-fly traps, is harmless. A description is also given of a Calliphorid larva, one of a number obtained from a case of nasopharyngeal myiasis in man in Mexico, which may prove to be the larva of *C. americana*.

Duke (H. L.). **Studies on the Factors that may influence the Transmission of the Polymorphic Trypanosomes by Tsetse. VII. *T. rhodesiense* versus *T. gambiense*: a Comparison of their Power to develop cyclically in *Glossina*.**—*Ann. trop. Med. Parasit.* **27** no. 4 pp. 569–584, 7 refs. Liverpool, 20th December 1933.

The following is taken from the author's summary: An examination of the Entebbe records of experiments on the transmission of *Trypanosoma gambiense*, *T. rhodesiense* and *T. brucei* by *Glossina palpalis*, R.-D. (and to a less extent by *G. morsitans*, Westw.) shows that *T. rhodesiense* is generally more readily transmissible cyclically than *T. gambiense*. The examination of strains of *T. brucei* from game tsetse areas is too limited to warrant any useful comparison of this species with the other two. The greater adaptability of *T. rhodesiense* to tsetse lends support to the belief that *T. rhodesiense* is in reality *T. brucei* that has overcome man's resistance. The alternative explanation, namely, that *T. rhodesiense* is *T. gambiense* that has enjoyed a longer or shorter association with *G. morsitans* instead of with *G. palpalis*, is also considered, and stress is laid on the need for direct experimental examination of this possibility.

Analyses des travaux publiés par les Instituts Pasteur d'Indochine en 1930–1931. Paludisme.—*Arch. Inst. Pasteur Indochine* no. 16 pp. 277–293, 10 refs. Saigon, October 1932. [Recd. January 1934.]

A summary is given of past and present work on malaria in Indo-China, based on papers published by various investigators during 1931, some of which have already been noticed [*R.A.E.*, B **19** 225; **20** 4, 62]. According to H. G. S. Morin, endemic malaria in the dry season in Tonkin is found in foci that are isolated and sporadic in the delta

zone, but are more and more closely associated in the intermediate and high zones. A large majority of the commonest Anophelines in the malarious foci belong to species that are rare or absent in healthy areas. Dissections show about 6–8 per cent. of them to be infected, the highest percentages being found in localities where the endemic indices are highest. The destruction of vectors in the vicinity of infected villages brings about an immediate decrease in clinical manifestations of the disease. The occurrence of certain isolated cases of locally acquired malaria at Hanoi confirms the fact that transmission may take place in that locality, although it is extremely infrequent. An investigation has shown that, although the local Anopheline population is dense, it is composed for the most part of species that have a low capacity for transmitting malaria, a fact that explains the rarity of cases in spite of the large numbers of gametocyte carriers and the absence of animals to attract zoophilous Anophelines. It is suggested that anti-mosquito and particularly anti-larval measures should be undertaken.

The anti-malaria campaign is being developed methodically throughout Indo-China, and in each region comparisons are being made between the healthy and unhealthy localities with a view to determining whether there is a common causal factor in all malarious regions, whether it is possible to modify such a factor sufficiently to bring about a decrease in malaria incidence as a whole, and what procedure, selected from those employed in countries in which anti-malaria work is well established, would be likely to produce the most satisfactory results under local conditions. Both economic and physiographical conditions in Tonkin are different from those in Cochin China, Cambodia and southern Annam, where satisfactory results against malaria have already been obtained. The work that is being carried out by the Malaria Services of the Pasteur Institute in the southern and northern parts of Indo-China is briefly summarised.

Li (Feng-Swen). **A List of the Disease-carrying Anophelines in the World.** [*In English.*]—*Yearb. Bur. Ent. Hangchow* no. 2 (1932) pp. 71–98, 2 maps, 4 pls., 5 pp. refs. Hangchow, August 1933. (With a Summary in Chinese.) [Recd. January 1934.]

A systematic list is given of the 71 species of *Anopheles* that have been found to carry malaria, showing whether the infection recorded was experimental or natural. Three further lists comprise respectively the species proved to be intermediate hosts of *Plasmodium vivax*, *P. falciparum* and *P. malariae*, showing the year, place and author of the record. The factors on which the prevalence of malaria in a given region usually depends and that may influence the effectiveness of the mosquitos as transmitting agents are briefly discussed. Special tables deal with the occurrence of malaria-carrying Anophelines in the chief countries or regions of the different continents, showing the principal vectors in each ; those in China are listed separately, with records of the provinces and districts in which they are found. The Anophelines known to be vectors of *Filaria* and the species transmitted are given in another list.

Baeza Cuéllar (M.). **Estudio médico de los Culícidos hematófagos.** [A medical Study of the Blood-sucking Mosquitos.]—Demy 8vo, iv+158 pp., 80 figs., 3 pp. refs. Madrid, 1933.

This monograph contains chapters on external morphology, internal anatomy, embryology and development, bionomics, the classification

of the subfamilies, including notes on some of the more important species and a list of all the known Anophelines with their synonymy, the relation of mosquitos to disease, measures against larvae and adults, and the technique of study. The adult, larva and pupa of *Anopheles* (*Myzomyia*) *rifeñus*, sp. n., are described. This species, which is allied to *A.* (*M.*) *superpictus*, Grassi, and *A.* (*M.*) *hispaniola*, Theo., was found in the Riff (Spanish Morocco) breeding in pools of clear water. The larvae appeared late in the year, about July. In winter, the adults were found in underground grain silos and in caves used by the tribesmen when sheltering against aerial attack. The species shows marked individual variations.

da Fonseca (F.) & Prado (A.). **Algumas verificações parasitologicas em ratos de São Paulo.** [Some Parasitological Records in Rats at São Paulo.]—*Rev. med.-cirurg. Brasil* **40** pp. 65–70, 1 pl. Rio de Janeiro, 1932.

Arthropods found on rats at São Paulo included some of the fleas and mites already recorded [*R.A.E.*, B **20** 148 ; **21** 10, 67, 68] as well as *Polyplax spinulosa*, Burm., and a fly, near *Lucilia purpurascens*, Wlk. (*ocularis*, Shannon), causing myiasis.

Fialho (A.). **Tifo exantematico de São Paulo.**—*Rev. med-cirurg. Brasil* **40** pp. 183–205, 6 pls. Rio de Janeiro, 1932.

Much of this information has already been noticed [*R.A.E.*, B **21** 67]. The disease in São Paulo appears to occupy a position intermediate between Mexican typhus and Rocky Mountain spotted fever [*cf.* **22** 2, etc.]. In one zone of the city, clearance of the bush near the dwellings at once reduced the number of cases occurring.

Pinto (C.). **Alguns mosquitos do Brasil e do oriente da Bolivia (Diptera. Culicidae).**—*Rev. med.-cirurg. Brasil* **40** pp. 285–309, 17 figs. Rio de Janeiro, 1932.

The mosquitos recorded from eastern Bolivia include *Anopheles albitarsis*, Arrib., *A. bachmanni*, Petrocchi, *A. tarsimaculatus*, Goeldi (*evansi*, Brèth.), *Aëdes* (*Stegomyia*) *aegypti*, L., *A. scapularis*, Rond., and two new Culicines. Those from Brazil include *Chagasia fajardoi*, Lutz, *Anopheles lutzi*, Cruz, *A. tarsimaculatus*, *Culex fatigans*, Wied. (*quinquefasciatus*, auct.), *Aëdes serratus*, Theo., *A. scapularis*, *A. fluviatilis*, Lutz, and *Psorophora cingulata*, F.

von Ihering (R.). **Os peixes larvophagos utilizados no combate á febre amarella e á malaria.** [Larvicidal Fish utilised in combating Yellow Fever and Malaria.]—*Rev. med.-cirurg. Brasil* **41** no. 7–8 pp. 221–234. Rio de Janeiro, 1933.

Various fish known to destroy mosquito larvae in America are discussed. In northeastern Brazil, the Rockefeller Yellow Fever Service has made extensive and successful use of a number of species for the control of *Aëdes* (*Stegomyia*) [*aegypti*, L.], the most effective being *Astyanax bimaculatus* in large tanks and *Hemigrammus unilineatus* in small ones.

The problem of controlling Anophelines in natural breeding-places by means of fish is rendered difficult by the fact that they are not the only source of food as are mosquito larvae in tanks. Furthermore,

aquatic plants afford shelter against fish. It is suggested, however, that attempts should be made to find native fish that are effective against Anophelines in order to avoid the need for introducing *Gambusia* and so disturbing an existing fish fauna.

HUFF (C. G.). **Comparative Studies on susceptible and insusceptible *Culex pipiens* in relation to Infections with *Plasmodium cathemerium* and *P. relictum*.** - *Amer. J. Hyg.* **19** no. 1 pp. 123–147, 2 pls., 2 figs., 16 refs. Baltimore, Md, January 1934.

The experiments described were carried out with a view to determining the mechanism by which certain individual mosquitos escape infection with parasites of avian malaria following repeated feedings on blood highly infectious to other individuals of the same species [*cf. R.A.E.*, B **19** 7]. The mosquitos (*Culex pipiens*, L.) were fed twice with an interval of 5 or more days on infected birds and then killed, after intervals varying from 12 to 68 hours. Observations were made on the morphological changes in the various elements of the blood meal in their stomachs, as well as on the cytological changes in the stomach epithelium and in the malaria parasite within the stomach during the course of digestion of the blood meal and the development of the parasite in both susceptible and refractory individuals. Of the 137 mosquitos examined, 80 had fed on birds infected with *Plasmodium cathemerium* and 57 on birds infected with *P. praecox* (*relictum*); of these, 43 and 23 respectively showed normal parasites resulting from both feedings and 30 and 32 failed to show any infection from either feed. In the 9 mosquitos in which parasites were taken up at one meal but apparently not at the other, the degree of infection was low and the parasites from one of the feedings may have been lost in sectioning or overlooked. Normal and degenerating zygotes were found in both susceptible and refractory individuals for about the first 30 hours, the numbers of normal zygotes generally decreasing with the passage of time. No cellular response on the part of the mosquito to invasion of the parasite was noticed. The intercellular penetration of the stomach wall by the zygote is described. No evidence was found of any differences in digestion between susceptible and refractory individuals, and it is concluded that, if such differences play a part in permitting infection in the former and preventing it in the latter, they are manifested only upon the parasites themselves. The degree of infection in susceptible mosquitos appears to be determined by some inherent characteristic of the individuals in an almost constant manner, in spite of differences in the numbers of gametocytes ingested and of whether or not there has been previous infection. The possible bearing of these findings on the explanation of differences in the ability to transmit malaria of different geographical races of Anopheline species is discussed.

The structures originally described by Ross as "black spores" were seen in oöcysts of all ages, and observations were made particularly on the early stages in their formation and their relation to sporozoites. The altering of the sporozoite was studied from its initial yellowing and thickening until it appeared as a large, dark-brown, bent or twisted structure. The author is inclined to explain the formation of these structures along the lines suggested by Mayne [**17** 254; **21** 77], as it seems likely that very fine tracheoles may invade the oöcysts and cause the chitinisation of the sporozoites. This process could also occur in young oöcysts not yet containing sporozoites, and by a somewhat

similar process " black spores " might be formed in mosquitos that had not been infected. It is pointed out that " black spores " within oöcysts show a decided tendency to form around sporozoites.

SCHAPIRO (L.). **Observations and Experiments on Mosquito Breeding in Pit Latrines in Panama.**—*Amer. J. Hyg.* **19** no. 1 pp. 254–259. 5 refs. Baltimore, Md, January 1934.

The establishment of pit latrines in the campaign against hookworms in rural areas in Panama is seriously interrupted by propaganda suggesting that, as many of them contain varying amounts of water during the rainy season, they are breeding-places of Anophelines and therefore a factor in the spread of malaria. Observations to test this possibility were carried out by R. Roux during the rainy season of 1929 on a number of latrine pits. Both mosquitos emerging from the pits and those resting on the walls were caught ; no Anophelines were found, and all but three of the other mosquitos belonged to the genus *Culex*, *C. fatigans*, Wied. (*quinquefasciatus*, auct.) constituting 49 per cent. of the total number. Of two latrines in which there was no breeding, one was dry and the other was oiled regularly ; breeding was most prolific in the one latrine that was not in use. Observations in the laboratory on the period of survival of Anopheline larvae (chiefly *Anopheles albimanus*, Wied.) in water of varying degrees of pollution did not give very conclusive results, though larvae in strong solutions all died. It is concluded that the pit latrines used in Panama are not important breeding-places of Anophelines.

GALLIARD (H.). **Un phlébotome nouveau du Mexique : *Phlebotomus yucatanensis* n. sp.**—*Ann. Parasit. hum. comp.* **12** no. 1 pp. 1–7, 3 figs., 6 refs. Paris, 1st January 1934.

The author describes from Mexico both sexes of *Phlebotomus yucatanensis*, sp. n., which resembles *P. trinidadensis*, Newst. He does not agree with Dyar [and da Costa Lima (*R.A.E.*, B **20** 161)] in treating the latter as a synonym of *P. cruciatus*, Coq., which he considers a *nomen nudum*, its descriptions not affording characters for identification.

SAUTET (J.). **Contribution à l'étude de l'*Anopheles maculipennis* en Corse. Gîtes d'été et gîtes d'hiver, dans leurs rapports avec le paludisme.**—*Ann. Parasit. hum. comp.* **12** no. 1 pp. 8–14, 1 map, 6 refs. Paris, 1st January 1934.

During three years spent in investigating the biology of Anophelines in Corsica, the author observed that the resting places of *Anopheles maculipennis*, Mg., in the warm region of the eastern plain are frequently different in winter and summer. In summer they are of two types, those in which a blood meal may be obtained and those in which the mosquitos rest after emergence or before oviposition. In the former, which are usually human habitations or stables and are often far from breeding-places, females predominate. In the latter, which are usually in the vicinity of marshes and canals where dwellings are infrequent and there is therefore no constant source of nourishment, gravid females and numerous males are usually found. Such places may play an important part in the epidemiology of malaria, since a man resting there may be bitten by a female infected in a feeding shelter. In winter, hibernating females usually seek dark, uninhabited shelters, but they are sufficiently active when disturbed to permit of the

transmission of malaria. The race of *A. maculipennis* in Corsica appears to be homodynamic [*cf. R.A.E.*, B **20** 212]. The differences in the hibernating habits of the races of *A. maculipennis* in Holland [*cf.* **18** 53] and Corsica may be due to the fact that, in a country as warm as Corsica, the winter diapause necessary for the successful continuation of the race [*cf.* **14** 123] is more difficult to accomplish and more easily interrupted, and the females therefore seek places where they will remain undisturbed.

ROUBAUD (E.). **Le point de vue anophélien dans l'anophélisme sans paludisme, en Europe.**—*Bull. Soc. Path. exot.* **26** no. 10 pp. 1215–1233, 11 refs. Paris, 1933.

The author discusses recent work on the biology of *Anopheles maculipennis*, Mg., and concludes that the regression of malaria infection in certain parts of Europe in spite of the continued abundance of Anophelines is due in general to the evolution of zoophilous races of this mosquito [*R.A.E.*, B **16** 210]. Although the evolution of such races appears to be connected with the extension of agriculture and the consequent increase in the number of domestic animals maintained, it is not related to the number of animals alone, but to the manner in which they are housed. This in turn is a result of climatic conditions, the cattle in northern and western Europe, from which region malaria has largely disappeared, being protected against adverse weather by dark, draughtless buildings that are eminently suitable as feeding and resting places for female Anophelines. Moreover, it is necessary that such conditions of stabling should obtain over large areas ; the presence of model farms with adequate cow-sheds, such as exist in Corsica and north Africa, among a population that continues to use primitive types of shelter is without effect on the local Anopheline population. In addition to stabling, other factors connected with the amelioration of economic conditions in the country must be considered to play a part in the production of zoophilous races. These include the severance of contact between the habitations of man and animals, and also the stabilisation of stagnant water surfaces and the control of flood-waters by cultivation, which preclude incessant changes in the Anopheline population and thus permit the establishment of the necessary equilibrium between the numbers of the Anophelines and of the cattle on which they feed [*loc. cit.*]. It is suggested that the existence in Holland of a zoophilous race (var. *atroparvus*, Van Thiel) that attacks man during the winter [**18** 53] may be due to the inadequate number of cattle present in the " polder " areas [*cf.* **22** 36], since this variety, or a biological type with similar hibernating habits, is still found in France in areas that were once highly malarious but are now practically free from the disease.

DELANOË (P.). **L'écureuil de Gétulie, *Atlantoxerus getulus* L., 1758, est-il un réservoir du spirochète hispano-marocain, *Sp. hispanicum* Nicolle et Anderson 1928 ?**—*Bull. Soc. Path. exot.* **26** no. 10 pp. 1244–1246, 1 ref. Paris, 1933.

DELANOË (P.). **Au sujet de la présence chez l'écureuil de Gétulie d'un spirochète sanguicole, probablement récurrent, différent du spirochète hispano-marocain.**—*T.c.* pp. 1246–1248.

In view of the finding of spirochaetes thought to belong to the group of *Spirochaeta hispanica* in lice [*Linognathoides pectinifer*, Neum.]

taken from *Atlantoxerus getulus* in Morocco [*R.A.E.*, B **21** 236], the author gives an account of his investigations covering more than two years in which two different strains of the spirochaete causing the Hispano-African form of relapsing fever were inoculated in several ways into numerous examples of *A. getulus*. He concludes that these rodents are so slightly susceptible that they are unlikely to be reservoirs of the disease in nature. He therefore considers that the spirochaetes found in the lice were probably obtained from other small rodents living in the same burrows as the ground squirrels. He also points out that the presence of a pathogenic organism in a suspension of an insect does not prove that the insect is capable of transmitting the disease.

The second paper records the presence in Morocco of a spirochaete in *A. getulus* to which guineapigs are not susceptible. It was not observed in lice from the ground squirrels nor found in the blood of white mice inoculated with a suspension of such lice.

Morin (H. G.), Bader (H.) & Martin (P.). **Sur le mode d'action larvicide du vert de Paris.**—*Bull. Soc. Path. exot.* **26** no. 10 pp. 1267–1273, 1 ref. Paris, 1933.

Experiments, of which only 5 are described, were undertaken to determine the relative toxicity to Anopheline larvae of arsenates and arsenites by comparing the action of a brand of Paris green that contained only traces of arsenate with that of copper arsenate made in the laboratory. The results showed that the toxicity of the copper arsenate is greatly inferior to that of the arsenite, a fact that seems to be connected with the reducing powers of the latter. Thus, in practice, the relative larvicidal value of Paris green should be estimated from its arsenite content, which should be 40 to 50 per cent. by weight in an active larvicide. A method for determining this is described.

Blanc (G.), Noury (M.) & Fischer (M.). **Le rat gris** *Mus norvegicus* **réservoir de virus de la fièvre récurrente hispano-africaine.**—*Bull. Acad. Méd.* **109** pp. 587–591, 3 graphs, 4 refs. Paris, 1933.

The authors record the finding in rats (*Mus norvegicus*) from Casablanca, Morocco, of a spirochaete identical with that obtained from *Ornithodorus erraticus*, Lucas (*marocanus*, Vélu) and thus confirm the view that domestic rodents are an important reservoir of the form of relapsing fever caused by spirochaetes of the group of *Spirochaeta hispanica*.

Legendre (J.). **Les moustiques arboricoles du Centre-Ouest.**—*Bull. Acad. Méd.* **109** pp. 605–607. Paris, 1933.

Notes are given on the bionomics of *Aëdes caspius*, Pall. (*punctatus*, Mg.) and *A. geniculatus*, Ol., as observed in a town on the west coast of France, where they breed in holes in trees, particularly elms, and bite man out of doors by day or night. It is suggested that the filling and cementing of the holes would prolong the life of the trees and prevent the breeding of these mosquitos.

Legendre (J.). **Hibernation du moustique commun.**—*Bull. Acad. Méd.* **109** pp. 802–805. Paris, 1933.

For three years the author has made observations in a town on the west coast of France on the bionomics of the race of *Culex pipiens*, L.,

having a dark thorax [*cf. R.A.E.*, B **20** 150]. Oviposition begins during the first half of April, and emergence of the first generation is completed by the end of May. The last eggs of the season are deposited during the first part of October, and the last adults emerge between the beginning of November and the middle of December. At the end of September, when the temperature drops considerably at sunset, the adults enter dwellings in the evening ; as many as 224 were observed between 5.10 and 5.50 p.m. to enter a room only occupied during the day, although none was seen in the rooms above where three people spent the night. All were unengorged females with developed fat-bodies and undeveloped ovaries. Some were seen almost every day in the cellar and the unoccupied room and, rarely, on the floor above, which is better heated, but after the end of January or the beginning of February they were no longer found. It would appear that they spend the two months before oviposition out-of-doors, possibly seeking the blood meal necessary for the maturation of their eggs. They withstand extreme cold well.

Tarwid (K.). **Ueber den systematischen Wert von** *Anopheles maculipennis alexandrae-schingarewae* **Sching. (Diptera, Culicidae).** [On the Status of *A. maculipennis alexandrae-schingarevi*, Sching.]—*Ann. Mus. zool. polon.* **10** no. 6 pp. 57–60, 1 fig., 3 refs. Warsaw, 25th September 1933. (With a Summary in Polish.) [Recd. January 1934.]

Of 4 males taken near Warsaw and externally identical with *Anopheles maculipennis alexandrae-schingarevi*, Sching., 3 had a hypopygium identical with that of *A. maculipennis*, Mg., while that of the fourth agreed with Shingarev's description [*R.A.E.*, B **16** 200]. It is therefore suggested that this form cannot have more than varietal status.

Herold (W.). **Die Entwicklung einer Aedinenplage im Sommer 1932 in Swinemünde.** [The Development of an Outbreak of *Aëdes* in the Summer of 1932 at Swinemunde.]—*Z. angew. Ent.* **20** no. 3 pp. 435–441, 3 figs. Berlin, December 1933.

Since 1919 the author has noted outbreaks of *Aëdes* at various seaside resorts on the islands in the delta of the Oder, and he here describes one that occurred in the summer of 1932 in the island of Usedom, when *Aëdes caspius*, Pall., appeared in large numbers during the latter part of August. Such outbreaks occur when meadows in which the mosquitos oviposit are flooded for a sufficient time to permit the development of a generation. The causes that led to the floods in this instance are discussed ; their prevention would be the only way of avoiding the danger of further outbreaks, but this would involve considerable expenditure.

Konsuloff (S.). **Berieselung und Malaria.** [Irrigation and Malaria.] *Z. angew. Ent.* **20** no. 3 pp. 461–463. Berlin, December 1933.

In 1922, the author advocated the method of alternate irrigation and drainage of rice-fields for the control of Anopheline larvae [*R.A.E.*, B **10** 193]. Dr. Collins, director of the Anti-malaria Station at Petritsch, Bulgaria, tested this method from 1928 to 1931 in two districts in the Struma valley and found that all Anopheline larvae were destroyed in well levelled fields. In badly levelled fields, some pools remained in

which breeding continued. The method appeared to increase the crop yield, but further experiments on this point were planned for 1933. In the warm Struma valley, owing to the rapidity of Anopheline development, the fields must remain flooded for periods of 7–8 days only, whereas the author found 10–12 satisfactory elsewhere in southern Bulgaria.

THORNTON (E. N.). **Malaria.**—*Rep. Dep. publ. Hlth S. Afr. 1932–33* pp. 24–33. Pretoria, 1933.

Although the decrease in malaria observed in South Africa, particularly Natal, during the summer and autumn of 1932–33 must be attributed largely to the effect of climatic conditions on Anopheline breeding-places, a certain amount was due to improved measures of control. As the greatest risk of contracting malaria is from Anophelines in buildings [*cf. R.A.E.*, B **21** 133], infection can be largely prevented even in the most malarious areas by screening, the use of mosquito nets, wiping furniture with kerosene rags, applying insecticides in houses, etc. An example is given of the success of such measures in an intensely malarious area where *Anopheles funestus*, Giles, was the vector. *A. gambiae*, Giles (*costalis*, Theo.) usually breeds in exposed areas free from vegetation that rarely need preliminary attention before larvicidal measures are undertaken, but in the breeding-places of *A. funestus* vegetation must be completely removed before larvicides can be satisfactorily applied. The cost of maintaining such clearings along water-courses is high, and for this reason larvicidal measures could not have been employed on the estates in question. Work against the adults is becoming increasingly popular in areas where control of the larvae is too costly.

An account is given of the organisation and work of various anti-malaria units. The systematic search for mosquitos in dwellings is of value, not only in assessing the efficacy of anti-larval measures, but also in forecasting the probable course of events during the ensuing month and in obtaining information on the species present.

DE MEILLON (B.). **Malaria Research Station, Tzaneen.—Research Activities.**—*Rep. Dep. publ. Hlth S. Afr. 1932–33* pp. 61–64. Pretoria, 1933.

In the Transvaal, *Anopheles funestus*, Giles, breeds in permanent streams and is therefore independent of local rainfall, the seasonal fluctuation in its numbers being entirely dependent on temperature. The stability of the population of this species is reflected by the intensity of malaria in areas where it predominates and by the absence of epidemics [*R.A.E.*, B **20** 75]. In localities below 2,500 ft., it is almost always found in houses (only 15 out of 1,015 individuals being taken elsewhere), and malaria is intense ; from this altitude up to 3,500 ft., larvae are still numerous, but adults do not enter habitations and malaria is absent. The house-frequenting race appears to be restricted to localities where there is an annual rainfall of not less than 30 inches (except where an area of low rainfall immediately adjoins one of high rainfall), a mean temperature of not less than 61°F. and a range of temperature of not more than 40°F.

The numbers of *A. gambiae*, which prefers small temporary pools, show seasonal and intra-seasonal fluctuations due to local rains and an

annual one due to abnormal temperatures prevailing over areas that are normally unsuitable; in South Africa, epidemics are always associated with this species. During the winter, when temperatures are unfavourable, breeding is confined to localities below 2,000 ft. where there are suitable breeding-places (usually pools in large rivers), an absence of frost, a mean temperature of not less than 61°F. and a range of less than 40°F. In summer, suitable breeding-places are much more plentiful, and although in dry years breeding may be restricted to river beds, conditions are sometimes favourable over very wide areas. Epidemics due to intra-seasonal fluctuations are usually local, for widespread rains over the whole of the western and northern Transvaal are rare ; they are not often serious, and deaths are unusual, since inhabitants that suffer yearly attain a certain degree of immunity and also have some experience in malaria treatment. Epidemics due to annual fluctuations are, however, much more dangerous, and deaths are not uncommon, since the populations infected are not immune and have no knowledge of treatment.

Larvae of *A. funestus* and *A. gambiae* often occur in the same area and even in the same stream, the former being confined to the shaded portions where there is a current and the latter to quiet, exposed backwaters [**19** 246]. Studies of the respective spots in the streams showed that the larvae are actually exposed to very different temperatures, the range in breeding-places of *A. funestus* being 5½°F. and in those of *A. gambiae* 42°F. On one occasion when a temperature of 34°F. was recorded in a small pool, such as is favoured by *A. gambiae*, the breeding-place of *A. funestus* showed a temperature of 56°F. The suggestion that the larvae of *A. gambiae* are relatively more resistant to high temperatures than those of *A. funestus* was confirmed by an experiment in which, out of 15 larvae of each species, all the former survived at 113°F. for 24 hours and none of the latter. Although eggs of *A. gambiae* were more resistant than those of *A. funestus*, the prevalent idea that they can resist desiccation in dried mud for months and then hatch with the onset of the rains is dispelled by the results of an experiment in which eggs at room temperature on damp blotting paper and in drying mud did not survive for longer than 6 days and 1 day respectively. It is thus apparent that they could not survive the intense heat (as high as 109°F.) of drying mud in nature. Adults emerged from pupae kept in wet mud not covered by water at room temperature, but not at 109°F. A comparison of the relative attractiveness to gravid females of *A. gambiae* of artificial and natural breeding-places showed that temperature was not the only factor concerned, and although the presence of certain organisms in the water appeared to be necessary, it is probable that other factors are also involved. Adult mosquitos lived 45 hours at 95°F. but only 1–4 hours at 104° and 10 mins. at 113°. Such temperatures are common in malarious areas, but *A. funestus* frequents dwellings, in which the temperature is lower. Similarly, in winter, adults persisted at a spot where frost occurred, but the minimum temperature inside the hut where they were found was 45°F. *A. gambiae* does not frequent houses so much, but in the crevices where it rests the temperatures are much less extreme and the relative humidity is higher than in the open air. Thus the ordinary climatic factors as measured in a Stevenson screen are of little value in studying the bionomics of these insects. It was found that *A. funestus* remains in dwellings during the whole time that it is maturing its eggs and thus has opportunities for repeated feeds, a fact that explains the

occurrence of high infection rates when the gametocyte rate in man is relatively low. Lights of 5 candle power did not prevent it from entering, but those of 300 candle power repelled it. Adults were found 2 miles from their point of origin, but 80 per cent. occurred within a half-mile radius. A flight of 4½ miles was recorded in one instance when no nearer source of human blood was available. *A. funestus* prefers to feed in an enclosed space ; a man sleeping in the open under a trap net was not visited. Citronella oil thoroughly applied over the whole body did not give protection from bites for longer than 5 hours, and spraying a hut with an insecticide at 8 p.m. did not prevent adults from entering early in the morning.

Jackson (C. H. N.). **On an Advance of Tsetse-fly in Central Tanganyika.**—*Trans. R. ent. Soc. Lond.* **81** pt. 2 pp. 205–221, 1 fldg. map. London, 30th December 1933.

The following is taken largely from the author's summary : An advance of tsetse-flies (*Glossina morsitans*, Westw.) has taken place within the present century in Kondoa, Mbulu and Singida Districts of the Central Province of Tanganyika Territory, to a maximum depth of about 50 miles from its origin in northern Kondoa. The situation, character, climate, vegetation, fauna and population of the country are described. Sleeping sickness does not yet occur in the area, the prevalent trypanosome being *Trypanosoma congolense*. The history of the advance, as reconstructed from various sources, makes it clear that the present grave state of affairs is not due to a mere increase in density of an indigenous tsetse population. Factors influencing the rate of the advance are discussed. Wet years in a dry country, such as that under consideration, may favour the increase of fly. The existence of suitable *Berlinia-Brachystegia* woodland implies that the advance will continue more or less rapidly. Dense, continuous thicket is an absolute barrier where it occurs in sufficient width. Certain types of thorn woodland, if extensive, delay advance and may arrest it. The movements of animals and the presence of motor roads do not appear to affect the advance as long as it is continuing through suitable country. Near large settlements the apparent density of fly is lower, and dense continuous settlement acts as a barrier. It would appear, but is not proved, that flies when still in small numbers tend to keep to the drainage valleys, which under other conditions are used purely as feeding grounds. It is suggested that they may do this owing to some social instinct. The progress of the advance is thought to depend mainly on the increase of population of tsetse, not because of any congestion, but because a larger fly population will provide a larger number of individuals wandering ahead of their own accord. It was not determined whether the most advanced flies have any tendency to return to the main body. The advance is likely to continue southwards and westwards, and to join in the west with two other advances approaching from different directions. The cattle of several native tribes are likely to suffer heavy losses or perhaps to be exterminated.

Mellanby (K.). **The Influence of Starvation on the Thermal Death-point on Insects.**—*J. exp. Biol.* **9** no. 1 pp. 48–54, 2 figs., 1 ref. London, January 1934.

Newly hatched lice, *Pediculus humanus*, L. (*corporis*, DeG.), and adults of *Culex fatigans*, Wied., were exposed to high temperatures for

either 1 or 24 hours, the humidity being controlled [*cf. R.A.E.*, B **20** 162]. The lice, whether fed or not, withstood a temperature of 46·5°C. [115·7°F.] for 1 hour, but the mosquitos succumbed to temperatures above 39°C. [102·2°F.]. The humidity of the air did not affect these results. When exposed for 24 hours, lice that had fed withstood 38°C. [100·4°F.] in moist air ; in dry air they only withstood 33°C. [91·4°F.], being killed by desiccation at higher temperatures. Full-fed mosquitos survived 37°C. [98·6°F.] for 24 hours in moist air, but not more than 32°C. [89·6°F.] in dry air. Unfed lice and mosquitos could not withstand such high temperatures for 24 hours, because their rate of metabolism was so increased by the heat that they died of starvation.

Papers noticed by Title only.

Wagner (J.). **Zweiter Nachtrag zum** [Second Supplement to the] **Kataloge der palaearktischen Aphanipteren (Wien, 1930).**—*Konowia* **12** no. 3–4 pp. 212–216. Vienna, 30th December 1933. [*Cf. R.A.E.*, B **18** 160 ; **19** 184.]

Patton (W. S.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Tribe Muscini, Subfamily Muscinae, based on a Comparative Study of the Male Terminalia. II. The Genus** *Stomoxys* **Geoffroy (sens. lat.)** [in which the author includes *Lyperosia* and its allies].—*Ann. trop. Med. Parasit.* **27** no. 4 pp. 501–537, 15 figs., 7 refs. Liverpool, 20th December 1933.

Brumpt (E.). **Spécificité parasitaire et déterminisme de la ponte de la mouche** *Lucilia bufonivora*.—*C. R. Acad. Sci. Fr.* **198** no. 1 pp. 124–126. Paris, 1934.

Brumpt (E.). **Les myiases chirurgicales.**—*Bull. Acad. Méd.* **109** pp. 891–899, 15 refs. Paris, 1933. [*Cf. R.A.E.*, B **21** 249.]

Nitzulescu (V.) & Dollfus (R. P.). **Présence à Richelieu (Indre-et-Loire) de** *Phlebotomus perniciosus* **Newstead.**—*Ann. Parasit. hum. comp.* **12** no. 1 p. 69, 1 ref. Paris, 1st January 1934.

Werneck (F. L.). **Sobre uma especie nova de** *Hoplopleura* **(Anoplura, Haematopinidae)** [*travessoi*, sp. n., on rat in Brazil].—*Rev. med.-cirurg. Brasil* **40** pp. 345–346, 1 fig. S. Paulo, 1932.

Martini (E.). **Dos nuevos mosquitos** *Anopheles* [*cricillium*, sp. n., and *parapunctipennis*, sp. n.], **procedientes del Estado de Chiapas, México.**—*Rev. mex. Biol.* **12** pp. 99–102. Mexico, 1932. [Recd. January 1934.]

Davis (N. C.). **Notes on some South American Mosquitos. ii. The Genus** *Mansonia*, **subgenus** *Rhynchotaenia*.—*Ann. ent. Soc. Amer.* **26** no. 4 pp. 619–639, 7 pls., 7 refs. Columbus, Ohio, December 1933.

Gambrell (F. L.). **The Embryology of the Black Fly,** *Simulium pictipes* **Hagen.**—*Ann. ent. Soc. Amer.* **26** no. 4 pp. 641–672, 12 pls., 48 refs. Columbus, Ohio, December 1933.

MOHLER (J. R.). **Report of the Chief of the Bureau of Animal Industry, 1933.**—47 pp. Washington, D.C., U.S. Dep. Agric., 1933.

Weekly counts of stable flies [*Stomoxys calcitrans*, L.] captured in traps in central Iowa during the summer and autumn of 1932 showed that the numbers increased during the first part of August, decreased in the latter part of the month and suddenly increased again during the first two weeks of September. A study of the incidence of swine fever (hog-cholera) in Iowa during the same period revealed one peak in the latter part of August and another in the latter part of September, thus following the periods of maximum fly prevalence by about two weeks. Although these data are not conclusive proof of transmission by the fly, they support those previously obtained [*cf. R.A.E.*, B **18** 100]. A stock solution containing 20 per cent. coconut-oil soap and 5 per cent. orthophenylphenol diluted with warm water (1 : 50) and used as a shampoo for dogs and cats is effective in killing their fleas, promotes healing of cuts and other external injuries and has no apparent toxic effects even in stronger concentrations. One per cent. orthophenylphenol dissolved in milk of lime destroyed mites when sprayed over the interior of fowl houses.

As a result of the continued campaign for the eradication of *Boophilus annulatus*, Say, further areas were released from Federal Quarantine during the year, the infested area, which is now only one-twelfth of its original size, being confined to parts of Florida, Louisiana and Texas. It appears that the cattle-fever (piroplasmosis) tick now generally found in the infested areas of Florida is *B. annulatus australis*, Fuller [*cf.* **21** 101], which is believed to be able to complete its life-cycle on one or more wild animals in addition to its domestic hosts. For this reason its eradication may involve the control of certain game animals. During the year, a few cases of re-infestation in tick-free areas, apparently due to the presence of numerous deer and of this variety of tick, were reported. Experiments on the vectors of anaplasmosis of cattle have shown that the disease may be transmitted by adults of *Rhipicephalus sanguineus*, Latr., infected as nymphs [*cf.* **19** 66] and by *Ixodes scapularis*, Say. Hereditary transmission [see the two following abstracts] has only been obtained in the case of the cattle-fever tick [*B. annulatus*]. A study of piroplasmosis has shown that both *Piroplasma* (*Babesia*) *bigeminum* and *P.* (*B.*) *argentinum* occur in Louisiana.

In the central zone of an area in Colorado in which an experiment on the eradication of cattle grubs [*Hypoderma*] has been in progress during the last five years, the number of larvae per animal was 5·1, as compared with 9·2 in the previous year and 35 at the beginning of the experiment. The animals have been effectively and safely treated by inserting into the warble holes small medicated rods made from ¾ oz. gum arabic, ¼ oz. glue, ¼ oz. tannic acid powder and 2 oz. derris powder mixed with enough water to make a stiff paste.

It has been determined that *Gastrophilus intestinalis*, DeG., reaches the stomach of a horse 21–28 days after the larvae are taken into the mouth [*cf.* **18** 274]. The experiments indicate that the animal can be successfully treated one month after the disappearance of the adult flies in the autumn, provided that it does not become re-infested from eggs laid on its coat ; the eggs on the coat can be destroyed by the application of suitable disinfectants.

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Dikmans (G.). **Anaplasmosis. I. Its Occurrence in Louisiana. II. A short Review and a preliminary Demonstration of its Identity in Louisiana. III. A further experimental Demonstration of its Identity in Louisiana. IV. The Carrier Problem.**—*J. Amer. vet. med. Ass.* **82** pp. 739–740, 741–748, 855–861, 862-870, 29 refs. Chicago, 1933.

The first paper records the occurrence, in five localities of Louisiana free from infestation by *Boophilus annulatus*, Say, of a disease of cattle diagnosed as anaplasmosis [*R.A.E.*, B **18** 101]. The second and third discuss the literature on the vectors and symptoms of anaplasmosis, and describe experiments from which it is concluded that the causal agent involved in Louisiana is the same one (*Anaplasma marginale*) that is commonly found associated with *Piroplasma bigeminum*, of which *B. annulatus* is the vector in the United States [*cf.* **19** 66 ; etc.].

In the fourth paper, a list is given of the species of ticks [**16** 161 ; **20** 273 ; etc.] and Tabanids [**20** 205 ; *cf.* **21** 224] that have been reported as transmitting anaplasmosis. In experiments with cattle in Louisiana of four animals artificially infested with larvae of *B. annulatus* that were the offspring of infected females, one developed the infection after 59 days, one was apparently immunised, one gave inconclusive and one definitely negative results. In similar experiments with *Amblyomma americanum*, L., which occurs naturally in Louisiana, only negative results were obtained.

Regendanz (P.). **Die Uebertragung von** *Anaplasma* **durch** *Boophilus microplus*. [The Transmission of *Anaplasma* by *B. annulatus microplus*.]—*Zbl. Bakt.* (1, Orig.) **130** no. 3–4 pp. 214–220, 1 pl., 13 refs. Jena, 4th December 1933.

Ticks of the genus *Boophilus* are commonly supposed to transmit anaplasmosis of cattle [*R.A.E.*, B **19** 66]. As, however, in contrast to the "three-host" species that have been shown to transmit the disease [**21** 70 ; etc.], *Boophilus* completes its life-cycle on one host, it would appear that it could only act as a vector if *Anaplasma*, like *Piroplasma* (*Babesia*) *bigeminum* [**20** 82], is inherited by it through the egg from infected parents. The author believes, however, that experiments in which such hereditary transmission was apparently sometimes demonstrated (including those of Dikmans [see preceding abstract], which he notices in a supplement) are inconclusive. In experiments by him in Brazil with *B. annulatus microplus*, Can., the offspring of infected females failed to transmit anaplasmosis. On the other hand, *Anaplasma* was sometimes found in the salivary glands of females that had fed as larvae on infected cattle. Such ticks would be potential vectors if they were accidentally transferred from one host to another, and the author suggests that this may happen not infrequently ; ticks migrate from a host that dies before they are fully fed, and possibly they may also be rubbed off and picked up by other animals.

Steward (J. S.). *Onchocerca cervicalis* **(Railliet and Henry 1910) and its Development in** *Culicoides nubeculosus* **Mg.**—*Rep. Univ. Camb. Inst. Anim. Path. 1933* **3** pp. 272–284, 9 pls., 6 figs., 9 refs. Cambridge, 1933.

A short description is given of adults and microfilariae of *Onchocerca cervicalis* found in the ligamentum nuchae and skin respectively of

horses affected with fistulous withers and poll-evil in Herefordshire in 1932. Investigations to ascertain the probable insect vector were carried out by feeding various blood-sucking Diptera on infected horses and subsequently examining them for microfilariae. Species of *Haematopota* and *Simulium*, which were dissected in moderate numbers, gave negative results, and it appears unlikely that they act as vectors. No microfilariae were found in *Stomoxys calcitrans*, L., mosquitos or Muscids that fed on blood from the bites of other Diptera, but the numbers dissected were too small to exclude them definitely from the possible vectors. About the middle of May, midges of the genus *Culicoides* were found feeding on an infested horse, and subsequent dissection showed living microfilariae in 9 individuals out of 172 of *C. obsoletus*, Mg., and 1 out of 6 of *C. parroti*, Kieff., though none was found in 140 of *C. pulicaris*, L., or 1 of *C. stigma*, Mg. Later *C. nubeculosus*, Mg., also became infected, and as it was the most numerous, it was used for experimental purposes. The various stages of the development of the microfilariae in the tissues of this midge are described, with notes on the methods of handling it and its manner of feeding ; the larval stages in *C. nubeculosus* resemble those of *O. volvulus* in *Simulium damnosum*, Theo. [*R.A.E.*, B **14** 167], but they require 24–25 days to reach the proboscis instead of 7–8.

Hitchins (A. P.). **A Window Screen Fly Trap.**—*Milit. Surg.* **73** no. 1 pp. 20–28. Washington, D.C., July 1933. (Abstr. in *Publ. Hlth Engng Abstr.* **13** p. Ma.28. Washington, D.C., 25th November 1933.)

Details are given for the construction of a fly trap consisting of a shallow box frame to fit window openings. A number of V-shaped troughs are bent into the wire screens that form the front and back, and in the apices of the troughs, which point towards one another, holes 1 inch apart are punched. Being only 4 inches thick, the traps do not reduce the light unduly and are said to be very effective against flies, mosquitos, etc. If baits are placed in them, they can be used in stables.

Gourdon (G.). **La capture et la destruction des insectes par rayons ultra-violets.**—*C. R. Congr. int. Appar. util. Lutte contre les Ennemis des Cultures Lyon 1929* pp. 127–133, 209–213, 8 figs. Paris, 1930. [Recd. 9th February 1934.]

A description is given of a trap [*R.A.E.*, A **17** 571, etc.] in which ultra-violet rays are used to attract and kill insects. Adaptations are also described for catching mosquitos, fleas, etc., and for use in buildings and on board ship.

Rösch (—). **Die *Aëdes vexans*-Plage im Mainzer Becken und die Rheinpegelstände.** [The Plague of *A. vexans* in the Mainz Basin and the Rhine Water-gauge Levels.]—*Z. GesundhTech. Städtehyg.* **25** no. 11 pp. 629–636, 1 diagr. Berlin, November 1933. [Recd. February 1934.]

In this district, the breeding-places of *Aëdes vexans*, Mg., are the meadows bordering the Rhine, and outbreaks of it occur when flooding and a favourable temperature coincide [*cf. R.A.E.*, B **21** 121, etc.]. Flooding does not cause the eggs to hatch in winter, but in experiments they could be made to do so by exposure to ether vapour prior to

immersion in water. On 2nd May, they hatched normally when water of ordinary temperature was poured on them. The connection of the outbreaks with the level of the Rhine is shown in curves of the water-levels reached at Bingen from 1921 to 1932, the years when the critical height was reached being those in which outbreaks occurred. The larvae feed at the bottom of the water ; in water 10 inches deep they died of starvation, because their air-supply was insufficient to enable them to reach that depth. This explains why they are absent where the ground slopes steeply. It is therefore suggested that where the level of the ground cannot be raised it should be lowered, the excavated soil being used to raise the level elsewhere above the height reached by floods.

KEMPER (H.). **Zweiter Beitrag zur Frage der Anwendbarkeit des Pyrethrumblüten-Pulvers bei der Bekämpfung tierischer Schädlinge in Wasserversorgungs- und Abwasserbeseitigungsanlagen.** [A Second Contribution to the Question of the Applicability of Pyrethrum Powder for the Control of Animal Pests in Water-supply and Drainage Systems.]—*Z. GesundhTech. Städtehyg.* **25** no. 12 pp. 681–690. Berlin, December 1933.

The use of pyrethrum against *Asellus aquaticus* and the larvae of *Orthocladius* sp. in water-supply and drainage systems in Germany has given good results in practice. In experiments with fish [*cf. R.A.E.*, B **21** 170], carp gradually became immune from the effects of sub-lethal dosages of the poison, but this immunity was lost after an interval in untreated water. The effect of pyrethrum was weaker and less lasting in aërated than in stagnant water. Its efficiency was ultimately destroyed by a strong alkali or acid, but was not affected by the differences in the pH value or hardness of water that occur in practice. The amount of active substances (pyrethrins) present in about 125 mg. of powder was found to be the maximum that could be taken up colloidally [*cf.* **21** 171] by a litre of water.

PEUS (F.). **Massenvorkommen von Halmfliegen (Chloropiden) an und in Gebäuden und Wohnungen.** [The Mass-occurrence of Chloropids on and in Buildings and Dwellings.]—*Z. GesundhTech. Städtehyg.* **26** no. 1 pp. 1–8, 1 fig., 2 refs. Berlin, January 1934.

This survey of recorded data regarding Chloropids is given in view of the infestation of houses in Germany by these flies. Of the species mentioned, *Chloropisca notata*, Mg., is the commonest. The temperature most favourable to the adults is 12–18°C. [53·6–64·4°F.]. At 8–9°C. [46·4–48·2°F.] they become very sluggish. High temperatures, especially with dry air, are unfavourable, and they soon die in living rooms. At the optimum temperatures, they seek sunny situations and tend to move upwards. In late autumn, the advent of cool weather drives them into shelters where they hibernate, surviving temperatures as low as —20°C. [—4°F.]. It is not certain whether one or two generations occur in a year. Where infested houses were not covered with creepers [*cf. R.A.E.*, B **21** 122], there were always densely growing plants quite close to the walls ; these provide temporary shelters, from which the cold in autumn nights drives the flies indoors. Infestation of rooms is accidental, the real winter quarters being hollow spaces along the walls or under roofs. A fly spray or a pyrethrum dust [**21** 197] should be used to kill them in rooms,

VINCENT (M.). **Some Observations on the Biology of a Hungarian Strain of** *Culex pipiens* **L.**—*Arb. ung. biol. Forsch. Inst.* **6** pp. 119–122, 6 refs. Tihany, 1933. (With a Summary in Magyar.)

In the summer of 1932, larvae of *Culex pipiens*, L., collected near Lake Balaton [*cf. R.A.E.*, B **21** 273] were reared in Hungary in bowls of water to which a little powdered biscuit was added. The 60 adults that emerged were kept in a cylinder over water, but no autogenous egg-rafts [*cf.* **18** 169; **21** 267, etc.] were laid. Subsequently they were taken to England, and, after a blood meal, some of them laid large egg-rafts, each containing over 200 eggs. Some of their offspring, however, laid autogenous eggs, and from these a strain has been reared to the tenth generation with unimpaired vitality without allowing the females any blood meals. The adults were usually fed on slices of apple to prolong life, but they would oviposit without any food whatever and were therefore truly autogenous. They were stenogamic, pairing readily in small cardboard cylinders. The autogenous rafts were laid about a week after emergence and contained about 100 eggs. The proportion of females that laid autogenous rafts seemed to be increasing with each generation. They fed readily on either man or birds and 4 or 5 days after a blood meal laid rafts of 250–350 eggs whether they had been previously fertilised or not, whereas the autogenous rafts were almost invariably fertile. Not all the females from Hungary gave rise to autogenous strains, and one strain reared was not stenogamic.

The author concludes that an autogenous race of *C. pipiens* co-exists in the neighbourhood of Lake Balaton with the normal race and interbreeds with it; in the two generations following cross-breeding in the laboratory, the power of laying autogenous rafts was lost, while that of pairing in a small space was retained.

SEBERS v. ZILHA (G.). **Unsere blutsaugenden Chironomiden.** [In Magyar.]—*Állat. Közlem.* **30** no. 3–4 pp. 146–151, 3 figs., 1 ref. Budapest, 19th December 1933. (With a Summary in German.)

Ceratopogonids recorded from Hungary, where they are widely distributed, are *Culicoides pulicaris*, L., *C. impressus*, Kieff., *C. nigrosignatus*, Kieff., *C. pallidicornis*, Kieff., with var. *brunneiscutellatus*, n., *C. cunctans*, Winn., and *Atrichopogon transversalis*, Kieff. The last-named attacked cattle resting in the shade at noon, and *C. pulicaris*, *C. pallidicornis* and *C. nigrosignatus* fed on them in the evening and at night in their stalls. *C. pulicaris*, *C. impressus* and *C. nigrosignatus* attacked man in the evening and at night, particularly in late summer.

LÖRINCZ (F.) & SZENTKIRÁLYI (S.). **Das Vorkommen von** *Phlebotomus macedonicus* **(Adler und Theodor 1931) in Ungarn. Beiträge zum Bestimmen der europäischen** *Phlebotomus* **Arten.** [The Occurrence of *P. macedonicus* in Hungary. Contributions to the Determination of the European Species. (*In Magyar.*)]—*Allat. Közlem.* **30** no. 3–4 pp. 160–169, 23 figs., 6 refs. Budapest, 19th December 1933. (With a Summary in German.)

In view of the occurrence in a district in Hungary in 1931 of several cases of dermatitis associated with *Phlebotomus macedonicus*, Adl. & Thdr. [*R.A.E.*, B **21** 274], a description is given of this sandfly, with a key to the European species of *Phlebotomus*.

Parrot (L.). **Notes sur les phlébotomes V.—Présence de** *Phlebotomus ariasi* **Tonnoir dans le sud-ouest de la France.**—*Arch. Inst. Pasteur Algérie* **11** no. 4 pp. 599–602, 3 figs., 3 refs. Algiers, December 1933.

Both sexes of *Phlebotomus ariasi*, Tonnoir, are redescribed from a male and two females taken near Bergerac (Dordogne). This species has been recorded previously only from Barcelona [*R.A.E.*, B **9** 88] and Alpes Maritimes [**19** 57 ; **20** 167], but it seems probable that it is distributed over the whole of southern France. As these examples were taken in a fowl-house, this species doubtless feeds on fowls ; it is also reported to bite man.

Collignon (E.). **Observations générales sur la campagne antipaludique de 1932 dans le Département d'Alger.**—*Arch. Inst. Pasteur Algérie* **11** no. 4 pp. 606–614, 4 pls. Algiers, 1933.

Ambialet (R.). **Observations sur la lutte antipaludique dans le Département de Constantine au cours du 2e semestre 1932.**—*T.c.* pp. 615–636, 5 pls.

Gouget (R.). **Observations générales sur la campagne antipaludique de 1932 dans le Département d'Oran.**—*T.c.* pp. 637–643, 3 pls.

Accounts are given of the work carried out in Algeria during 1932 in the course of anti-malaria campaigns by the recently created Anti-malaria Service. The data include notes on Anopheline breeding-places and the measures taken to eliminate them. The larvae collected in Oran proved to be those of *Anopheles maculipennis*, Mg., and of *A. hispaniola*, Theo., the former being by far the more abundant.

Foley (H.). **Les moustiques du pays Ajjer. Présence à Djanet d'***Anopheles dthali* **Patton.**—*Bull. Soc. Hist. nat. Afr. N.* **24** no. 9 pp. 342–343, 3 refs. Algiers, December 1933.

A re-examination by F. W. Edwards of a collection of mosquitos from southern Algeria [*cf. R.A.E.*, B **18** 106 ; **19** 106] revealed the presence among specimens labelled *Anopheles hispaniola*, Theo., of a single male of *A. d'thali*, Patt. [*cf.* **19** 173].

Brumpt (E.). **Essai de transmission, par l'***Ornithodorus turicata*, **d'une souche de** *Spirochaeta novyi*, **ayant subi plus de 3,000 passages sur rats.**—*C. R. Soc. Biol.* **115** no. 6 pp. 600–602, 4 refs. Paris, 1934.

From the results of experiments, the author concludes that either *Spirochaeta novyi* is not transmitted by *Ornithodorus turicata*, Dug., and is therefore distinct from *S. turicatae* [*cf. R.A.E.*, B **21** 240, 244] or it has lost the power of developing in this tick, which may have been its natural vector in 1906. As the latter hypothesis cannot be verified, he considers that the causal agent of relapsing fever in the United States is *S. turicatae*.

Foley (H.) & Parrot (L.). **Sur la rareté de** *Ornithodorus erraticus* **Lucas** (=*O. marocanus* **Velu**) **dans le Sahara oranais.**—*Congr. int. Ent. Paris 1932* **5** 2 Trav. pp. 705–706, 1 ref. Paris, 1933.

Further examinations of rodent burrows near Beni Ounif for the tick, *Ornithodorus erraticus*, Lucas (*marocanus*, Velu) [*cf. R.A.E.*, B **17**

238] in December 1929 and 1930 and in April 1932 gave negative results, but in April 1931 12 adults were taken in a burrow adjacent to the one previously found to be infested. Inoculation of a suspension of these ticks into guineapigs and mice failed to reveal infection with *Spirochaeta hispanica.*

Franchini (J.). **Les ornithodores des colonies italiennes de l'Afrique du nord. Espèces, localités où ils ont été rencontrés, maladies qu'ils transmettent.**—*Congr. int. Ent. Paris 1932* **5** 2 Trav. pp. 707–710, 9 refs. Paris, 1933.

The author reviews the literature on *Ornithodorus foleyi*, Parr. (*franchinii*, Rondelli) [*cf. R.A.E.*, B **17** 144; **18** 207; **20** 63] and briefly describes experiments in which the excreta and coxal fluid of two examples from Tripoli were injected into rats, but no spirochaetes were subsequently discovered. In order to determine whether *O. savignyi*, Aud., and *O. moubata*, Murr., from certain localities in Tripoli were naturally infected with relapsing fever, the intestinal contents of several reared examples were injected into young rats and mice. The results were negative, although these ticks readily became infected when allowed to bite rats infected with African relapsing fever [*Spirochaeta duttoni*].

Heim de Balsac (H.). **Myiase mortelle du poussin de pigeon ramier (*Columba palumba* L.).**—*Congr. int. Ent. Paris 1932* **5** 2 Trav pp. 711–712, 1 ref. Paris, 1933.

Tephrochlamys flavipes, Zett., and *Hydrotaea dentipes*, F., were reared in eastern France from larvae taken in autumn from a living wood pigeon fledgeling that had fallen from the nest and that died shortly afterwards. The adults emerged in April at the time the wood pigeons are nesting, and it is suggested that the larvae of the first generation are saprophagous in the excreta of the first brood of these birds.

Monier (H.). **Résultats des recherches d'index spléniques et hématologiques dans la haute vallée du Mékong.**—*Bull. Soc. Path. exot.* **26** no. 10 pp. 1252–1254. Paris, 1933.

Monier (H.). **Le paludisme à Luang Prabang et à Paklay-Laos, en avril 1933.**—*Op. cit.* **27** no. 1 pp. 17–19, 2 refs. Paris, 1934.

In the second paper, data recorded in the first and in one already noticed [*R.A.E.*, B **22** 32] are correlated. It is concluded that in the dry season at Luang Prabang the zones where Anophelines (particularly *Anopheles culicifacies*, Giles) are abundant are those where the percentages of enlarged spleens and the blood infection rates are highest. The centre of the town, which is protected by the suburban population, by the scarcity of breeding-places, etc., shows an infection rate of only 5·76 per cent. A further survey should be undertaken during the rainy season, in August–September, when the malaria epidemic is at its height.

Since the immigrant Annamese population showed infection rates inferior to those of the native population in the vicinity, it cannot be regarded as a reservoir of the disease. At a locality between 2,600 and 3,250 ft. above sea level, no adults or larvae of Anophelines were found, although the spleen and infection rates showed that malaria was prevalent. As contact with the plains is rare, it would appear that

during the rainy season, when the natives report that malaria is most severe, the temporary breeding-places of Anopheline vectors must be very abundant.

GALLIARD (H.) & SAUTET (J.). **Note préliminaire sur les races d'*Anopheles maculipennis* de Corse.**—*Bull. Soc. Path. exot.* **27** no. 1 pp. 30–34. Paris, 1934.

Various characters of the adults and larvae of *Anopheles maculipennis*, Mg., from different localities have been studied with a view to determining the races that exist in Corsica, where malaria is present on the coastal plains but absent from the mountainous regions. From an examination of the larvae and the hypopygia of the males, it is concluded that the majority resemble var. *labranchiae*, Flni., or var. *atroparvus*, van Thiel. The race is of average size, though there are both larger and smaller forms ; the maxillary index is 15·4.

GILLY (C.). **Activité du Service d'Hygiene de la Circonscription de Dakar pendant l'hivernage 1933 (1er juin au 1er décembre).**—*Bull. Soc. Path. exot.* **27** no. 1 pp. 87–93. Paris, 1934.

During late June and early July and in September–November, outbreaks of plague occurred in and near Dakar. Despite the fact that the foci were limited to the same quarter, sometimes even to the same hut, the infection could not have been transmitted from man to man, as all the individuals of a group contracted the disease at the same time. Wherever it occurred in man, numerous dead rats and mice were found, and most of those examined proved to be infected. Examination of the rodents captured daily throughout the year in the Dakar region disclosed the existence of infection in the wild ones in one locality. By the beginning of May, it had spread to rats in the town. The first rains fell at the beginning of June, a few days before the outbreak of plague was recorded in man, and it is worthy of note that it is at this time that the sand flea, *Synosternus pallidus*, Tasch., the most frequent parasite of natives in this region, leaves the wet ground to live temporarily in the fur of rats [*cf. R.A.E.*, B **21** 152] ; subsequently it returns to the dry floor of the huts. Thus murine plague preceded and accompanied the outbreak in man, and it is suggested that, although *S. pallidus* is rarely infected [*cf.* **20** 202 ; **21** 153], it is so numerous that it probably pays a part with *Xenopsylla cheopis*, Roths., in the transmission of the disease. Cases of plague ordinarily occur in hovels in a bad state of repair, to which rats gain easy access and in which they find shelter. In one hovel, serving as a store-house, as many as 68 rats were taken from burrows at one time. Vigorous anti-plague measures were undertaken, including the application of sprays [*cf.* **20** 202] to the ground in huts and courts.

GIAMARCHI (P.) & SAUTET (J.). **Contribution à l'étude des accidents dûs à la piqûre des araignées en Corse.**—*Rev. Méd. Hyg. trop.* **25** no. 5 pp. 257–260, 4 refs. Paris, 1933.

The authors describe the symptoms produced in man by the bite of *Latrodectus tredecimguttatus*, Rossi, the most important of the poisonous spiders of Corsica.

De Asis (C.). **"Red Back" Spider Bite and Magnesium Sulphate Treatment.**—*Amer. J. trop. Med.* **14** no. 1 pp. 33–44, 14 refs. Baltimore, Md, January 1934.

Latrodectus hasselti, Thorell, a poisonous spider commonly found in some parts of the Philippines, is briefly described, and an account is given of the symptoms of four persons bitten by it. These cases were successfully treated with intravenous injections of magnesium sulphate, and as their symptoms were similar to those produced by *L. mactans*, F., it is suggested that such treatment might also be effective against its bites.

Russell (P. F.) & Santiago (D.). **An Earth-lined Trap for Anopheline Mosquitoes.**—*Proc. ent. Soc. Wash.* **36** no. 1 pp. 1–21, 5 pls., 2 refs. Washington, D.C., January 1934.

In view of the difficulty of capturing adult Anophelines by day in the Philippines [*cf. R.A.E.*, B **20** 59 ; **21** 50], experiments have been made in the construction of traps. The most efficient is a simple box-like structure of which the main feature is a layer of soil 1 inch thick on the inside of the walls and roof, held in place by wire screening (16-mesh) and kept moist by a drip-can resting on the top of the box. The trap, which has no floor, is placed directly on the ground. One end is not boarded but is kept partly closed at night by means of a black cloth which hangs down to within 6 ins. of the ground. Several sizes of trap were used, the smallest being 2 ft. high 2 ft. wide and 3 ft. long. This size was effective, but in somewhat larger traps the catches are likely to be higher. Collections were made in the morning by raising the cloth and (by the light of a flash lamp) removing the mosquitos one by one in glass vials. Similar box-like traps without the inner lining of soil did not give such good results, presumably because they did not so closely resemble natural shelters [*cf.* **21** 50].

Lever (R. J. A. W.). **Entomology and Agriculture in the British Solomon Islands.**—*Trop. Agriculture* **11** no. 2 pp. 36–37, 6 refs. Trinidad, February 1934.

Notes are given on mosquitos [*R.A.E.*, B **21** 200] and on *Lyperosia exigua*, de Meij., which is the only primary pest of cattle in the Solomon Islands [*cf.* **21** 155] and was probably introduced from New Britain about 1923. Pure-bred zebu cattle are somewhat more resistant to attack by this fly than shorthorns or hybrids between the two. *Musca domestica vicina*, Macq. [**21** 200] feeds at the wounds caused by *Lyperosia*. A small colony of the Pteromalid, *Spalangia cameroni*, Perk., was introduced from Fiji [*cf.* **17** 209] and liberated on Guadalcanal, but it proved to have rather a wide host range. It is hoped that a hybrid between the male of *S. sundaica*, Graham, from Java, and the female of *S. orientalis*, Graham, from Australia [*cf.* **20** 259] may shortly be introduced.

Backhouse (T. C.). *Anopheles punctulatus* **as an experimental Intermediate Host of** *Wuchereria bancrofti*.—*Trans. R. Soc. trop. Med. Hyg.* **27** no. 4 pp. 365–370, 5 refs. London, 31st January 1934.

In experiments in New Britain, out of 43 females of *Anopheles punctulatus* var. *moluccensis*, Sw. & Sw., fed on a man infected with

Filaria (*Wuchereria*) *bancrofti*, 20 survived for 14 days or more; on dissection, 14 of these showed morphologically mature infective-stage larvae. In a similar experiment with the typical *A. punctulatus*, Dön., only 11 mosquitos fed out of about 50, and mature larvae (none of which occupied the labium at the time of dissection) were found in 3 out of the 4 that survived 16 days or more.

Kuipers (J.) & Stoker (W. J.). **Een *A. ludlowi*-epidemie in Oost-Java.** [An Epidemic of Malaria in East Java transmitted by *Anopheles sundaicus*.]—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 2 pp. 74–90, 1 map, 2 graphs, 6 refs. Batavia, 16th January 1934. (With a Summary in English.)

From June to August 1933, a serious epidemic of malaria transmitted by *Anopheles sundaicus*, Rdnw. (which is regarded as a variety of *A. ludlowi*, Theo.) occurred in the village of Brengkok on the north coast of Java about 1¼ miles from the sea. Adult mosquitos were captured from 24th July to 21st August. In one night, 43 of *A. subpictus*, Grassi, and 1 of *A. aconitus*, Dön., were taken in a cowshed, and by day 157 of *A. sundaicus*, 971 of *A. subpictus* and 1 of *A. aconitus* in dwellings. Of 964 *A. subpictus* and 2 *A. aconitus*, none was infected. Of 146 *A. sundaicus*, 68 were infected, 32 with oöcysts only and 24 with sporozoites only. The correlation between gut and gland infection [*R.A.E.*, B **19** 189] was therefore established in nature. The absence of infection in *A. subpictus* is remarkable and shows the necessity for separate entomological investigation in each locality.

No larvae of *A. sundaicus* could be found, the dry season being too far advanced, but a survey of its potential breeding-places was made by a method devised by the senior author and now regularly used in eastern Java, whereby the known breeding requirements of this species are correlated with data on rainfall, flooding, and topography. A striking conformity was found between the rainfall curve (involving the formation of brackish water pools) and the malaria mortality curve. Fish-ponds near the sea are considered of minor importance, the chief breeding-places being the rice-fields nearer the village. Owing to the salinity of the soil, the water in them becomes rapidly brackish after the rains and thus suitable for *A. sundaicus*. In the actual wet season, there are no brackish pools. A comparison of the curves of mortality, rainfall and mosquito abundance showed that the epidemic was due to the abnormally low rainfall in 1933.

Dunnewold (R.). **Een nieuwe *Anopheles*-larve (*A. leucosphyrus* var. *hackeri* ?).**—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 3 pp. 170–173, 1 fig. Batavia, 30th January 1934.

A description is given of Anopheline larvae found in a tree-hole in southern Sumatra, and the characters differentiating them from those of *Anopheles punctulatus*, Dön., and *A. leucosphyrus*, Dön., are given. Some pupae from the same breeding-place developed into adults that appeared to be those of *A. hackeri*, Edw. [*cf. R.A.E.*, B **21** 146].

Cross (D.). **Some Theoretical and Experimental Observations on Malarial Prevention on Estates.**—*Malayan med. J.* **8** no. 4 pp. 261–274, 15 refs. Singapore, December 1933.

After discussing malaria control in general and the unsatisfactory state of the malaria situation in Malaya as a whole, the author points

out the need for finding anti-mosquito measures that are less expensive than oiling, even if less immediately effective. Of a group of estates practically all planted with rubber or with rubber interplanted with cassava, those owned by Europeans, where larvicidal and other measures were undertaken, were often more malarious than those owned by Asiatics, where such measures were ignored. Larvae of Anophelines, including *Anopheles maculatus*, Theo., were found on all the estates at different times, but were usually found more readily on the unoiled Chinese estates. The large numbers of cattle stabled in close proximity to the huts on three Chinese estates might have explained their comparative freedom from malaria, but for the fact that on a fourth estate there were few if any cattle. The other most obvious feature distinguishing the Chinese estates was that in practically all the ravines on them vegetables were extensively cultivated, use being made of the abundant supply of cow-dung. With a view to testing the idea that water thus polluted might be unsuitable for the breeding of *A. maculatus* or might prevent the larvae from reaching maturity, all water on one division of a malarious European estate was sprayed weekly with a solution of cow-dung, and dumps of semi-solid manure were made at intervals along the drains and at the tops of the ravines to increase the pollution. The proportionate improvement in the health of the labourers was greater on this part of the estate than on the other division, where oiling was carried out, the percentage of fever cases decreasing from 42 to 14 and from 28 to 11 respectively. The percentage of positive slides found at the quarterly examination of labourers on the first division fell from 31 in August 1931 (at the beginning of the experiment) to 7 in August 1932. *A. maculatus* was seldom found in either division. In an independent survey of the first division in September 1932, only a few larvae of *A. vagus*, Dön., were found and these not in the manured drains. As the experiment was on a small scale and other factors tended to reduce the amount of malaria, the results are inconclusive, but they suggest that further experiment along these lines is desirable.

GATER (B. A. R.). **Notes on Malayan Mosquitoes, V. Some Remarks on *Anopheles maculatus* Theobald in Relation to Malaria.**—*Malayan med. J.* **8** no. 4 pp. 277–283, 2 graphs, 13 refs. Singapore, December 1933.

With a view to determining whether the different forms of *Anopheles maculatus*, Theo., occurring in Malaya differ in their ability to transmit malaria, 128 females that had been fed on a case of malignant tertian [*Plasmodium falciparum*] were divided into batches according to the degree of abdominal scaling. In all, 67 became infected, and susceptibility did not vary to any great extent in the various groups. It appears that the maximum incidence of adults of *A. maculatus* occurs between February and July, and that their numbers then decline, although there is a slight increase in December. On one estate, the seasonal distribution of mosquitos was ascertained by trapping them with human bait and by collecting them in buildings. The result plotted against the daily sickness rate among the labour force (which is held to indicate accurately the amount of malaria present) showed that the latter followed the variations in the former except in December, in which the increase in the sickness rate (which appears to be due to fresh infections and not to relapses) occurred in the same month as the increase in mosquito incidence. The monthly incidence of the females of all the

species caught throughout the year is shown in a table. It is difficult to incriminate any of these except *A. maculatus*, as none is a vector of importance and there are few increases in numbers towards the end of the year. Moreover, dissections of 1,726 mid-guts and 1,712 glands during this period, revealed infection only in *A. maculatus* in March. It is suggested that the increase in malaria that occurs in December, 9 months after the maximum incidence of *A. maculatus*, may be accounted for by a protracted period of incubation, such as is believed to occur in Holland [*R.A.E.*, B **18** 52].

LAL (R. B.) & SHAH (K. S.). **Malaria and Water-logging.**—*Rec. Malar. Surv. India* **3** no. 4 pp. 583–634, 2 maps, 11 charts, 6 refs. Calcutta, December 1933.

In certain areas in the Punjab, the construction of irrigation systems led to a gradual rise in the subsoil water level due to percolation from the canals, and this brought about water-logged conditions of the soil and caused the alkaline salts to accumulate near the surface. In some parts, the high alkalinity rendered the soil impermeable, and rain-water stood on the surface for considerable periods. In low-lying areas, swamps were also formed by seepage from the canals. As a consequence, large tracts of land became unfit for cultivation, the population suffered great economic loss and their health was seriously affected, mainly by chronic malaria. Investigations on the reclamation of such land were undertaken in the Gujranwala District, and observations were made at monthly intervals from November 1927 to January 1931 on the health of the populations of villages in the experimental area (and in a control village in the water-logged tract outside) to determine the effect of the measures adopted. These consisted mainly in the growing of particular crops and the construction of an elaborate system of open seepage drains to carry away surface water and maintain continuous movement of subsoil water.

Of the eight species of *Anopheles* observed, *A. stephensi*, List., and *A. culicifacies*, Giles, which were found in fairly large numbers throughout the year, were the most important malaria vectors. *A. annularis*, Wulp (*fuliginosus*, Giles) is a poor vector, but as it was abundant, it probably also played a part in the transmission of the disease. *A. stephensi* bred freely in practically all available collections of clean water, particularly in the drains carrying seepage water, whereas the breeding of *A. culicifacies* was almost confined to ponds and puddles. The latter fact probably explains the increasing prevalence of the former species in the later period of investigation, when the amount of surface water decreased as the number of drains increased. Drainage did not apparently reduce the actual number of malaria-transmitting mosquitos, and it would appear that an improvement in the health of the populations of the experimental villages was due partly to the presence of a dispensary, and partly to better economic conditions resulting from the reclamation operations.

SWEET (W. C.) & RAO (B. A.). **Notes on Malaria in Mysore State. Parts I–IV.**—*Rec. Malar. Surv. India* **3** no. 4 pp. 635–718, 4 graphs. Calcutta, December 1933.

A detailed account is given of investigations on malaria carried out in three representative areas of Mysore State between October 1928 and

December 1930. The first three parts of the paper, which deal with the topography, meteorology and malarial season, the Anophelines, and the spleen and parasite rates, are by Sweet alone, and the fourth, which deals with control work, is by Sweet and Rao together.

A list is given of the 22 species of Anophelines taken in Mysore ; further dissections [*cf. R.A.E.*, B **20** 61] showed that infection is confined to *Anopheles culicifacies*, Giles, *A. stephensi*, List., and one or more of the group comprising *A. fluviatilis*, James (*listoni*, List.), *A. minimus*, Theo., and *A. varuna*, Iyen. Infected mosquitos were reported in all the months, excepting July, from March to December. The seasonal catches of Anophelines in all three areas are recorded and discussed.

The results of three experiments in malaria control are given in detail. Spleen and blood examinations were made at least once a quarter, and Anophelines were caught in selected stations once a week. In one locality, plasmochin compound was administered to the population, and larval breeding-places were treated with a 1 per cent. mixture of Paris green. As the road dust in this area was somewhat heavy and difficult to spread as a cloud, ash was mixed with it in proportions that varied according to the strength of the wind but were usually about 5 parts ash to 6 parts road dust. Although it was not found possible to persuade more than 26 per cent. of the population to take the plasmochin compound each week, the control work resulted in a marked reduction in both spleen and parasite rates, which was most noticeable after 18–19 months. There was also a reduction of about 70 per cent. in the average monthly catch of females of the malaria-transmitting species, but little reduction in the numbers of the other Anophelines. In another locality, where only the larvicide was used, the results were inconclusive and difficult to interpret. In the third locality, the weekly distribution of plasmochin compound alone apparently slowed down a naturally increasing benign tertian [*Plasmodium vivax*] infection, markedly reduced infections with malignant tertian [*P. falciparum*] and significantly lowered the spleen rate ; the seven examinations made after it was stopped gave evidence of an increase in both parasite and spleen rates.

GUPTA (P.), DAS (G.) & MAJUMDAR (N. R.). **Further Investigations into the Malarial Conditions at Kachugaon, Goalpara District, Assam, and the Results of Anti-malarial Measures (Abstract).**— *Rec. Malar. Surv. India* **3** no. 4 pp. 843–849, 1 ref. Calcutta, December 1933.

In further work carried out at Kachugaon and its vicinity [*cf. R.A.E.*, B **21** 82] between June 1932 and May 1933, two additional species of *Anopheles*, *A. gigas*, Giles, and *A. splendidus*, Koidz., were taken, but no larvae of these or of *A. culicifacies*, Giles, were found. Of 1,530 females dissected, the only ones infected were 5·56 per cent. of 934 of *A. minimus*, Theo. February, March and April were the only months in which no infections were observed. Anti-larval measures, which were carried out from July 1932 within a radius of half a mile round Kachugaon, consisted of oiling all permanent breeding-places once a week and treating temporary breeding-places, rice-fields and the edges of streams with Paris green. Vegetation growing near

dwellings was also removed to reduce the shelter for adult mosquitos. The total weekly catch of mosquitos at four stations fell from 276 in June 1932 to 20 at the end of April 1933.

WEBSTER (W. J.). **Bed Bugs in rarified Air.**—*Indian J. Med. Res.* **21** no. 3 p. 523, 1 ref. Calcutta, January 1934.

In connection with the problem of the control of *Cimex hemiptera*, F., in railway carriages in India, various experiments were carried out (one of which is briefly described), which showed that neither the bugs nor their eggs are destroyed by a degree of partial vacuum much greater than could be readily obtained in an infested railway carriage.

LEONARD (A. B.). **Notes on Larvae of *Cuterebra* sp. (Diptera : Oestridae) infesting the Oklahoma Cottontail Rabbit.**—*Trans. Kansas Acad. Sci.* **36** pp. 270–274, 5 figs., 8 refs. Manhattan, Kans., 1933.

Of 36 cotton-tail rabbits collected in Oklahoma, 5 females were infested with the larvae of *Cuterebra* sp., probably *C. cuniculi*, Clark, which are described. Since most of the larvae were found near the nipples, the author believes that the eggs may have been laid there.

WEHR (E. E.). **The Life History of *Gastrophilus* Larvae of the Horse, and Lesions produced by the Larvae.**—*Cornell Vet.* **23** no. 3 pp. 254–271, 22 refs. Ithaca, N.Y., July 1933.

The author reviews the literature on the bionomics of the various species of *Gastrophilus* attacking horses, and gives an account of his own observations on *G. intestinalis*, DeG., and *G. nasalis*, L. Beginning on 27th July 1931, larvae of *G. intestinalis* in a small amount of water were squirted on to the tongue of a colt 3½–4 months old every day except Sundays for 85 days, a total of 12,920 being administered. The larvae were obtained from eggs on hairs clipped from the legs of horses each week, which were maintained in an incubator at 20–25°C. [68–77°F.]. These hatch if immersed, when mature, in water heated to about 40°C. [104°F.], and it is concluded that heat, moisture and, probably to a less extent friction, are the necessary stimuli [*cf. R.A.E.*, B **20** 135]. Active larvae were obtained from eggs removed as long as 50 days previously. A post-mortem examination of the colt on 22nd October showed 713 larvae in the second or third instar attached to the left side of the stomach, one fixed to the mucous membrane of the oesophagus, and another lying unattached at the back of the tongue near the entrance to the pharynx, besides a large number of first-instar larvae embedded in the mucous membrane of the tongue, lips and cheeks.

Eggs of *G. nasalis* placed in an incubator in a dry atmosphere mostly hatched within 3–4 days. About 50 larvae were fed to the colt with those of *G. intestinalis*, and at the post-mortem about a dozen third-instar larvae were found attached to the mucous membrane of the pyloric region of the stomach and in the anterior portion of the duodenum, but it is possible that these had hatched from eggs that remained attached to the hairs of the throat and had reached their position by another route [*cf.* **20** 56] or had been in the digestive tract of the colt before the experiment was begun.

Cooley (R. A.). **Occurrence of Tick Parasites in Nature in southern Idaho.**—*Publ. Hlth Rep.* **49** no. 4 pp. 111–112. Washington, D.C., 26th January 1934.

Ixodiphagus texanus, How., is recorded from *Ixodes hexagonus* var. *cookei*, Pack., taken from a woodchuck in Idaho in June 1932, 8 adults emerging from one of two parasitised nymphs [*cf. R.A.E.*, B **17** 123]. The work on the biological control of ticks in the United States [**17** 122–125, 128 ; **19** 137, 138] has all been carried out with *Hunterellus hookeri*, How., of which A. B. Gahan has recently shown *I. caucurtei*, du Buysson, to be a synonym.

Simmons (J. S.), Kelser (R. A.) & Cornell (V. H.). **Attempts to transmit the Virus of Acute Anterior Poliomyelitis through** *Aëdes aegypti*.—*Proc. Soc. exp. Biol.* **31** no. 4 pp. 496–498, 8 refs. New York, January 1934.

Attempts to obtain transmission of the virus of poliomyelitis from infected to healthy monkeys by means of *Aëdes aegypti*, L., were unsuccessful, but the authors consider that the possibility of insect transmission of this disease deserves further investigation.

Davis (N. C.), Frobisher jr. (M.) & Lloyd (W.). **The Titration of Yellow Fever Virus in Stegomyia Mosquitoes.**—*J. exp. Med.* **58** no. 2 pp. 211–226, 1 chart. New York, 1st August 1933. (Abstr. in *Trop. Dis. Bull.* **31** no. 2 p. 81. London, February 1934.)

Titration experiments show conclusively that in *Aëdes aegypti*, L., the quantity of yellow fever virus present never surpasses that originally ingested. It appears that the average mosquito engorged on highly infectious blood contains between 1 and 2 million lethal doses of the virus. During the succeeding fortnight, the amount of titrable virus is reduced to not more than 1 per cent. of that present in freshly fed females. Subsequently the titre seems to rise, but this may be the result of an increase of extra-cellular virus, or of that more easily freed by grinding. It would therefore appear that, in spite of the so-called incubation period in the mosquito, during which the virus migrates to the salivary glands, transmission is essentially mechanical, and for this peculiar type the authors suggest the term " delayed mechanical."

Siler (J. F.). **Report of the Health Department of the Panama Canal for the Calendar Year 1932.**—Med. 8vo, 94 pp. Balboa Heights, C.Z., 1933.

Aëdes taeniorhynchus, Wied., which is a vicious biter of man and animals, is the most troublesome mosquito in the Panama Canal Zone, where it is active from June to August. Its control is impracticable, as its breeding-places are situated many miles beyond the area under supervision, the dispersal flights extending for 10–30 miles. Annual variations in breeding conditions affect the density of the mosquitos and the distances covered ; although numbers invaded the Canal Zone in 1931, no large flights were observed in 1932. Species of *Mansonia*, particularly *M. titillans*, Wlk., also attack man and at times become pests, especially in the Miraflores Lake area. The removal of the aquatic plants from which the larvae of this genus obtain their supply

of oxygen is impracticable on account of the cost, but it has recently been found that the emergence of adults can be materially reduced by heavy applications of larvicidal oil. In the storm-water sewers of Panama City and elsewhere, *Culex fatigans*, Wied. (*quinquefasciatus*, auct.) breeds in large numbers during the dry season in water that collects in sections that have sunk below grade. Breeding is controlled by flushing the sewers and mixing oil with the water at the end of the process in order to leave a film on any that remains. By routine inspection of premises and the enforcement of building regulations that forbid the installation of roof gutters, the breeding of *Aëdes aegypti*, L., is kept at a low level.

Studies on the breeding habits of Anophelines [*cf. R.A.E.*, B **21** 64], which were continued in 1932, have confirmed the suggestion that the periodic flights of *A. albimanus*, Wied., into controlled areas about the end of the dry season originate in the more remote parts of Gatun Lake; not only are conditions in the Lake conducive to prolific breeding, but the prevailing warm, damp, windless weather appears to stimulate the adults to greater activity. Within a month of the influx of Anophelines, the malaria rate increases appreciably. In the lake areas, the breeding of *A. albimanus* is markedly greater in patches of *Chara* near dwellings. Where bladderwort (*Utricularia mixta*) occurs with *Chara*, *A. albitarsis*, Arrib., predominates and *A. bachmanni*, Petrocchi, and *A. strodei*, Root, are occasionally found. Breeding in the small Miraflores Lake group near Pedro Miguel is controlled by oil sprays, and in the reservoir from which the water supply of the town is taken the *Chara* is removed before it appears at the surface, but no form of control seems to be economically practicable over the large areas of Gatun Lake infested with *Chara*. This lake is nowhere less than 12 miles distant from the Pacific terminal cities or 4 miles from the Atlantic ones, and the largest patches of *Chara* are much further away; as careful investigation has failed to reveal other breeding-places of any size nearer the cities at the time when the periodic flights of *A. albimanus* occur, it is concluded that these Anophelines can fly much further than is usually considered possible.

SOPER (F. L.), PENNA (H.), CARDOSO (E.), SERAFIM jr. (J.), FROBISHER jr. (M.) & PINHEIRO (J.). **Yellow Fever without *Aëdes aegypti*. Study of a Rural Epidemic in the Valle do Chanaan, Espirito Santo, Brazil, 1932.**—*Amer. J. Hyg.* **18** no. 3 pp. 555–587, 4 maps, 18 refs. Baltimore, Md, November 1933. [Recd. February 1934.]

A description is given of an outbreak of yellow fever that occurred in 1932 in a rural district in which *Aëdes aegypti*, L., was not found even after a thorough and prolonged search begun six weeks before the apparently spontaneous disappearance of the disease. At no time were appreciable numbers of mosquitos caught inside houses, although species of *Phlebotomus* were present. A list is given of the numerous species of mosquitos caught with an animal bait outside, but close to, dwellings. Of those considered to be possible vectors, *Aëdes scapularis*, Rond. [*cf. R.A.E.*, B **18** 166] was the most probable, since it was the only one found at all the points where there is reasonable certainty that local transmission of yellow fever occurred. It proved to be a ready and vicious biter. No cases were found in towns in the surrounding area where *A. aegypti* was numerous. It is possible that *A. fluviatilis*, Lutz [**19** 108] may be partly responsible for transmission; in the

laboratory it is a relatively more efficient vector than *A. scapularis*, and natural breeding-places suitable for it were found at many points, although but few adults were taken at animal baits. The finding of larvae of this species in ant-rings [**22** 29] indicates that it may breed in artificial water containers.

The percentage of immune persons was extremely low considering the distribution of the epidemic and the length of time that it was known to have lasted, and the disappearance of the disease must be attributed to the inefficiency of the insect vector rather than to development of immunity in the population. *Phlebotomus* spp. were the only insects other than mosquitos that could be considered, in view of their abundance and distribution, as possible vectors.

DA FONSECA (F.). **Notas de acareologia. I. Papel dos acarianos do genero *Trombicula* na transmissão das rickettsias pathogenicas e applicação dessa hypothese á** *Rickettsia brasiliensis*.—*Mem. Inst. Butantan* **7** (1932) pp. 127–133, 16 refs. S. Paulo, ? 1933. **II.** *Ichoronyssus butantanensis*, **sp. n. (Acarina, Dermanyssidae). (Nota previa.)**—*T.c.* pp. 135–138, 1 fig. **III. Parasitismo do homen e de** *Cavia aperea* **por** *Liponissus bacoti* **(Hirst, 1913) (Acarina, Dermanyssidae).**—*T.c.* pp. 139–143, 1 fig., 9 refs. **IV. Presença do** *Ophionyssus serpentium* **Hirst, 1915 (Acarina, Dermanyssidae) no serpentario do Instituto Butantan.**—*T.c.* pp. 145–146, 1 fig., 4 refs. **V.** *Trombicula butantanensis*, **sp. n. (Acarina, Trombidiidae).**—*T.c.* pp. 147–150, 1 fig. **VI. Duas novas especies de larvas do genero** *Trombicula : Trombicula ophidica*, **sp. n. e** *Trombicula ewingi*, **sp. n. (Acarina, Trombidiidae) : nota sobre** *Trombicula butantanensis* **Fl. da Fonseca, 1932 e sobre a inexistencia de** *T. akamushi* **(Brumpt, 1910) entre nós.**—*T.c.* pp. 151–158, 2 figs. (With Summaries in English.)

The first paper discusses the rôle of mites of the genus *Trombicula* in the transmission of diseases of the typhus group [*cf. R.A.E.*, B **16** 231, 261, etc.] and the possibility of their being vectors of *Rickettsia brasiliensis*, which is regarded as the causal agent of São Paulo typhus [*cf.* **21** 67]. It is concluded that the epidemiological data warrant further study.

The second paper describes *Ichoronyssus butantanensis*, sp. n., from a white mouse bred in São Paulo, the third records the finding of *Liponyssus bacoti*, Hirst [*cf.* **21** 68] on a child in whose home a case of São Paulo typhus had been reported, and the fourth the discovery on an introduced python of *Ophionyssus serpentium*, Hirst.

In the fifth paper *Trombicula butantanensis*, sp. n., is described from a larva taken engorged on man in São Paulo, and the sixth includes a further note on this species as well as descriptions of two new ones from larvae taken on snakes in Brazil. *T. akamushi*, Brumpt, the vector of tsutsugamushi disease, has not been found in São Paulo.

JOAN (T.). **Algunos agentes de diseminacion de la garrapata comun del ganado vacuno.** [Some Agents in the Spread of the Common Cattle Tick.]—*Bol. mens. Minist. Agric. Argent.* **34** no. 1 pp. 85–88. Buenos Aires, July 1933. [Recd. February 1934.]

Though no instance is known of the introduction of *Boophilus annulatus microplus*, Can., into a tick-free area in Argentina except by means of cattle, Lahille has recorded its occurrence on marsh deer and

found that larvae attached themselves when placed on dogs. In experiments by the author, the larvae were reared to the adult stage on sheep, a goat and a donkey.

TROLLI (G.). **Résultats d'une enquête sur la présence et la vitalité des insectes et rats et notamment des moustiques à bord des avions de la ligne Léo-Stanleyville.**—*Bull. Inst. roy. colon. belge* **3** pp. 601–630. Brussels, 1932. (Abstr. in *Bull. Hyg.* **8** no. 11 p. 742. London, November 1933.)

Further investigations on the possibility of diseases being spread by rats and insects carried in aeroplanes [*cf. R.A.E.*, B **20** 149] were undertaken in the Belgian Congo during the second half of 1932 on the air-route between Léopoldville and Stanleyville. Mosquitos capable of transmitting yellow fever found in hangars were 1 individual of *Aëdes aegypti*, L. (*argenteus*, Poir.), 1 of *Eretmopodites chrysogaster*, Graham, and *Mansonia* (*Mansonioides*) *africana*, Theo., which was taken frequently at Leopoldville but only once at Stanleyville. In aeroplanes, 1 *Aëdes*, 9 *Mansonia* (*Mansonioides*) and 5 *Culex* were found. Mosquitos appeared to be introduced at the intermediate stops and not at night stations. In experiments on vitality, mosquitos caught on the previous day were fed and placed in cages consisting of wooden frames surrounded by mosquito netting, which were subsequently packed in wooden boxes with a pad of wadding soaked in water against the netting. The mortality amongst the mosquitos placed in the aeroplane was between 45 and 64 per cent.; it did not appear to be influenced by atmospheric conditions, speed, weather or temperature, but was higher on the journeys that took 3 days than on those that took 2 and was greatest on the last stage of the last day's flight. All the mosquitos that arrived alive were capable of living a long time whether fed or not. *Glossina palpalis*, R.-D., withstood the journey by air very well. Traces of rat excreta were found almost everywhere, but especially in aeroplanes that had stopped at Coquilhatville. The author concludes that the transport of mosquitos infected with yellow fever by aeroplane on a journey of over 1,000 miles lasting 2 or 3 days and at a maximum altitude of 6,500 ft. is possible [*cf.* **21** 183], but the danger involved can easily be avoided by strict surveillance of the conditions at aerodromes and the destruction of insects in aeroplanes at intermediate ports and at night stations.

DU PLESSIS (E. K.). **Natal's Nature Sanctuaries in Zululand.**—Cr. 4to, 28 pp., 19 figs. Pietermaritzburg, Natal Witness, Ltd., 1934. Price 1*s.* 6*d.*

This popular description of the game reserves of Natal and their fauna is preceded by an article on sleeping sickness and trypanosomiasis of domestic animals in which the arguments against game destruction as a measure for tsetse-fly control are emphasised. It is pointed out that, even if such a measure were effective, the elimination of *Glossina* would not necessarily bring about the suppression of trypanosomiasis of animals, as there are already areas where the disease is present in the absence of the fly. In Zululand, domestic stock is the chief source of infection, and transmission is mainly effected by blood-sucking flies other than tsetse. As the trypanosomes involved are characterised by the diversity of their natural hosts, the destruction of game would be ineffectual unless the smaller mammals, and possibly birds and reptiles,

were also destroyed, a procedure that is not feasible in a sparsely populated, bush-covered country such as Zululand. Probably it would not greatly diminish infection in tsetse, as trypanosomes are very rare in the peripheral circulation of game animals in Zululand. Nor would it destroy the fly by starvation, since other sources of nourishment are available, but it might drive it to attack man and domestic animals more frequently. Game can exist in arid areas where cattle cannot survive, and in times of scarcity it serves as an important source of food for the native populations. The measures advocated for the control of trypanosomiasis are improved methods of treatment and the use of immune breeds of cattle.

MARTIN (M.). **Life History and Habits of the Pigeon Louse** (*Columbicola columbae* (**Linnaeus**).—*Canad. Ent.* **66** no. 1 pp. 6–16, 6 figs. 9 refs. Orillia, January 1934.

A detailed account is given of the bionomics of *Columbicola columbae*, L., based chiefly on observations in the laboratory at Texas, where the lice were maintained on feathers from the breast of a pigeon in petri dishes in an incubator. A list is given of the birds from which it has been recorded. On two occasions, the author has taken it from the Hippoboscid, *Pseudolynchia maura*, Big., on pigeons. The processes of pairing, oviposition and hatching, and the morphology of the egg, the three nymphal instars and the adult are described, with measurements of each stage and the length of time taken for its development.

[BEKLEMISHEV (V. N.) & POLOVODOVA (V.).] **Беклемишев (В. Н.) и Половодова (В.). Ueber den Einfluss der Pflanzengesellschaft auf das Larvenleben von** *Anopheles maculipennis*. [On the Influence of the Plant Community on the Larval Life of *A. maculipennis*. (*In Russian.*)]—*Med. Parasit. parasit. Dis.* **2** no. 6 pp. 341–363, 1 fig., 12 refs. Moscow, 1933. (With a Summary in German.)

Investigations on the presence of larvae of *Anopheles maculipennis*, Mg., in various types of standing water in Magnitogorsk [*R.A.E.*, B **20** 90] were continued in 1931. Detailed notes are given on the characters of the aquatic and amphibious plants in meadows flooded by the River Ural. It was found that the numbers of larvae occurring in a plant community increased in proportion to the increase of the surface of the submerged assimilative organs of the plants and of the perimeters of the parts that come in contact with the surface of the water. Plants rising above the surface produce unfavourable conditions by shading the water and suppressing the lower vegetation ; in the south, however, their presence is beneficial to a certain extent, the shade protecting the larvae from the excessive heat of the sun. A small addition of *Elodea* or such plankton flora as *Lemna trisulca*, filamentous algae, etc., to a vegetation of the unfavourable type results in a sharp increase of the numbers of the larvae, whereas a small addition of unfavourable plants to a favourable community does not affect larval abundance. Following seasonal changes in the character of the vegetation, the maximum abundance of the larvae shifts from one type of plant community to another.

In studies of the survival of the mosquito larvae under various ecological conditions, over 2,000 samples of water containing over 50,000 larvae were examined. It was found that on an average only

7·5 per cent. of the first-instar larvae reached the pupal stage, the percentage varying inversely with the abundance of the larvae in a breeding-place. It is probable that the maximum numbers of pupae result from the larvae of the first and second generations (mid-May to mid-July), and that after this a high mortality is caused by the decay of the vegetation.

The numbers of adult mosquitos emerging daily in different plant communities were estimated by dividing the average number of pupae by the number of days that represents the duration of the pupal stage. The results showed that the average number emerging in 24 hours for all types of plant communities was 1 per sq. m. The maximum (about 2 per sq. m.) emerged from waters with such aquatic vegetation as *Elodea* and small-leaved plankton flora, or such narrow-leaved amphibious plants as *Agrostis alba*.

[Beklemishev (V. N.) & Mitrofanova (Yu.).] **Беклемишев (В. Н.) и Митрофанова (Ю.). Ueber den Einfluss des Mikroklima der Unterschlüpfe auf die Verteilung und Aktivität von** *Anopheles maculipennis*. [On the Ecology of the Adult Female of *A. maculipennis*. The Influence of the Microclimate of the Day-time Quarters on the Distribution and Activity of Mosquitos. (*In Russian.*)]—*Med. Parasit. parasit. Dis.* **2** no. 6 pp. 363–380, 3 graphs, 12 refs. Moscow, 1933. (With a Summary in German.)

A detailed account is given of a series of observations in various buildings in Magnitogorsk in the summer of 1931, from which it is concluded that a relative humidity below 60 per cent. is unfavourable to adult females of *Anopheles maculipennis*, Mg., at the usual summer temperatures of 16–30°C. [60·8–86°F.]. At a humidity above this, the mosquitos usually rest during the day close to the ceiling or on the lower surface of tables and other furniture, avoiding the light. At a lower humidity, they usually concentrate near the floor if the air there is less dry than that near the ceiling. At least half the day-time shelters examined had a humidity below 60 per cent. at temperatures of 24–30°C. [75·2–86°F.], which considerably decreased the activity of the mosquitos. The latter enter these shelters at night, and though the conditions become unfavourable during the day, they remain there, as those out of doors are even less favourable. They are active and attack man only at certain combinations of temperature and humidity, the maximum activity at 20–25°C. [68–77°F.] being reached at 63 per cent. humidity. Activity is also affected by wind, light, the physiological condition of the mosquitos, etc. Darkness alone, without an increase of humidity to 63–65 per cent., does not induce activity. On the other hand, man is sometimes attacked in the open during the day if the humidity is high (71 per cent.).

Observations in the summer of 1932 in Dzhungaria (south-eastern Kazakstan), which lies in the desert zone under climatic conditions much hotter and drier than Magnitogorsk, showed that here, at 20 and 26–27°C. [68 and 78·8–80·6°F.], the mosquitos became active at relative humidities of 43–44 and 48 per cent. respectively. They attacked man in houses by day or night when the air humidity ranged from 43 to 53 per cent. These facts indicate the existence of physiologically distinct races of *A. maculipennis*. On the basis of the structure of the

hypopygia of the males in both localities and the type of the hibernation quarters in Dzhungaria (cold uninhabited places), the authors believe the majority to belong to the race *messeae*, Flni.

[Shlenova (M. F.).] **Шленова (М. Ф.). Die herbstliche Veränderung des physiologischen Zustandes von** *Anopheles maculipennis* **in Karatal.** [Autumn Alterations in the Physiological Condition of the Females of *A. maculipennis* in Karatal (Semirech'e). (*In Russian.*)]—*Med. Parasit. parasit. Dis.* **2** no. 6 pp. 389–397, 8 refs. Moscow, 1933. (With a Summary in German.)

Laboratory examinations during August and September 1932 of females of *Anopheles maculipennis*, Mg., in south-eastern Kazakstan showed that some develop the fat-body when possessing mature ovaries, whereas others begin to do so immediately after emergence, while the eggs are still immature. The former occurred from mid-August onwards, and the latter from the beginning of September. In late September all the newly-emerged females seemed to utilise the ingested blood exclusively for the formation of the fat-body, and by 1st October the mosquitos could only be found in hibernation quarters (uninhabited houses), all having a well-developed fat-body and immature ovaries and containing no blood.

A single blood meal was sufficient to mature the eggs in practically all the females in early August and in most of them in late August, so that gonotrophic concordance [*R.A.E.*, B **18** 53] was complete. In some, however, especially in September, the ovaries remained immature even after a blood meal had been digested, though no fat-body was formed. Such females began to occur as early as 8th August, one week before the appearance of those with a developing fat-body and matured eggs, and it is therefore suggested that this partial gonotrophic dissociation is a more exact criterion of the physiological changes that take place in the mosquitos in autumn than the presence or absence of the fat-body.

[Shlyapina (K. V.).] **Шляпина (К. В.). Der Wasserfaktor in Bezirk Lissitschansk und der Einfluss der Vegetation in der Uferzone auf die Entwicklung der Larven von** *Anopheles maculipennis* **Mg.** [The Water Factor of the Lisichansk Region and the Influence of the Vegetation of the Bank Zone on the Development of the Larvae of *A. maculipennis*. (*In Russian.*)]—*Med. Parasit. parasit. Dis.* **2** no. 6 pp. 397–400. Moscow, 1933.

In a district in eastern Ukraine, no Anopheline larvae were found in pools of water from melted snow, most of which dried up in May, but about 19 per cent. of them harboured larvae of *Aëdes diantaeus*, H., D. & K., *A. maculatus*, Mg., and *A. dorsalis*, Mg., which were sometimes numerous. Pools and puddles of rain water, which quickly dried up, were free from mosquito larvae. Those of *Anopheles maculipennis*, Mg., occurred throughout the summer in ravines in running water from springs, and in ponds, lakes and rivers, provided that there was aquatic vegetation at the edge of the water. Of two adjoining portions of a water reservoir, both equally exposed to the sun, the one containing filamentous algae, etc., harboured numerous larvae, whereas none occurred in the other, which was free from vegetation. In the presence of surface flora, the character of the bed of the reservoir did

not play any part in the larval infestation, though a shallow, shelving bottom is usually more favourable [*R.A.E.*, B **19** 125]. In lakes, larvae of *A. maculipennis* were present near the banks only where there was floating vegetation, and were not found where the water was exposed to wind. When numerous eggs and larvae were released into a small lake in a part that was free from vegetation, none of the larvae survived, and the small waves carried all the eggs to the shore. Larvae released in another part among aquatic vegetation continued to thrive.

The author concludes that the occurrence of the larvae in a water reservoir depends largely on aquatic vegetation reducing the movement of the water.

[Korovitzkiĭ (L. K.) & Artemenko (V. D.).] **Коровицкий (Л. К.) и Артеменко (В. Д.). Zur Biologie des** *Aëdes aegypti*. [Data on the Biology of *A. aegypti*. A Contribution to the Question of the Possibility of the Development of *A. aegypti* under the Climatic Conditions of Odessa, in Connection with the Danger of the Introduction of Dengue into the Ports of southern Ukraine. (*In Russian.*)]—*Med. Parasit. parasit. Dis.* **2** no. 6 pp. 400–406, 4 refs. Moscow, 1933.

In view of the possibility of the introduction of dengue and its vector, *Aëdes aegypti*, L., into the ports of the Ukraine by ships [*cf. R.A.E.*, B **17** 107, 198], laboratory investigations on this mosquito were carried out in Odessa in 1929–31 with material collected in Sukhum (Transcaucasia). The adults were kept in small cages containing diluted honey and tumblers of water for oviposition, and were fed every 5 days on human blood. The eggs were transferred to glass jars of about 4 pints capacity in which the larvae were reared, *Spirogyra* being added from time to time. It was found that from mid-May to the end of August three generations could develop out of doors, or four under the conditions of an inhabited building. The eggs proved to be very resistant to desiccation; those that were stuck to the walls of the tumblers did not lose their viability when left unprotected during the hottest time of the year for periods varying from 17 to 63 days. Eggs also remained viable when kept for six months in an unheated room at a temperature sometimes as low as —6°C. [21·2°F.]; but none survived the winters of 1929–30 and 1930–31 in the open at mean temperatures ranging from —4·5° to 17·2°C. [24–63°F.]. Under identical conditions, the duration of the egg-stage varied from a minimum of 2 days to a maximum of 25. The first larvae appeared in mid-May or mid-June, and the larval stage lasted 5–19 days, the period from mid-July to mid-August being the most favourable for larval development. The pupal stage lasted 2–6 days, the last adults emerging out of doors in early September, and in a basement at the beginning of October.

Contrary to statements in the literature, the mosquitos paired at any time of day or night at temperatures considerably below 22°C. [71·6°F.] and sometimes even after the females had had a blood meal. Females survived for average and maximum periods of 15 and 42 days out of doors, 18 and 62 days in a basement, and 10 and 24 days in a heated room. As, however, an average period of 18 days elapses between pairing and oviposition, most of the females die before the eggs mature. Usually a female lays 27–30 eggs at a time, though one deposited 63. The adults often succumbed when kept at 35–36°C. [95–96·8°F.] or exposed to the sun.

[Moshkovskiĭ (Sh. D.) & Nosina (V. D.).] **Мошковский (Ш. Д.) и Носина (В. Д.). Färbung der Moskiten** (*Phlebotomus*) **als Methode zum Studium ihrer Biologie und Oekologie.** [Staining Sandflies as a Method of studying certain Aspects of their Biology and Ecology. (*In Russian.*)]—*Med. Parasit. parasit. Dis.* **2** no. 6 pp. 407–409. Moscow, 1933.

In experiments in Sebastopol in 1932 to ascertain the range of flight of *Phlebotomus papatasii*, Scop., sandflies were marked for release by placing them in a glass vessel having the walls and bottom covered with a powdered dye. The presence of dye on a captured sandfly was detected by placing it on a sheet of filter paper and dropping a little alcohol on it, thus producing a stain on the paper. About 600 sandflies caught on 17th July were coloured with methylene blue and released just before sunset on the following day at a distance of 77 yards from an isolated inhabited house. A few days later, about 1,500 stained with basic fuchsin were liberated 120 yards from the same house. Of the sandflies collected daily in this house from 19th July to 2nd August, 37 were not stained, 11 stained blue were taken between 19th and 29th July, and 2 stained red on 26th July. A heavy thunderstorm had occurred soon after the liberation of the sandflies stained with fuchsin. Only one of the 13 stained sandflies was a male.

Papers noticed by Title only.

Metalnikov (S.). **Immunité chez les insectes.**—*Congr. int. Ent. Paris 1932* **5** 2 Trav. pp. 209–220, 9 refs. Paris, 1933.

Parrot (L.). **Sur la phytophagie des larves de** *Phlebotomus papatasi*.—*Congr. int. Ent. Paris 1932* **5** 2 Trav. pp. 713–714, 1 fig. Paris, 1933. [*Cf. R.A.E.*, B **21** 21.]

Roubaud (E.). **Aperçus expérimentaux sur les races trophiques et biologiques de l'***Anopheles maculipennis*.—*Congr. int. Ent. Paris 1932* **5** 2 Trav. pp. 715–733, 8 figs. Paris, 1933. [*Cf. R.A.E.*, B **20** 151, 212.]

Senevet (G.). **Notes sur les moustiques** [in Algeria].—*Congr. int. Ent Paris 1932* **5** 2 Trav. pp. 735–741, 1 fig., 7 refs. Paris, 1933. [See *R.A.E.*, B **21** 83.]

Sergent (Ed.), Parrot (L.) & Donatien (A.). **Quelques observations sur la biologie des Cératopogoninés d'Algérie.**—*Congr. int. Ent. Paris 1932* **5** 2 Trav. pp. 743–746, 9 refs. Paris, 1933. [See *R.A.E.*, B **21** 83.]

Colas-Belcour (J.). **Sur une nouvelle larve d'ornithodore nord-africaine** [*Ornithodorus foleyi*, Parr.].—*Arch. Inst. Pasteur Tunis* **22** no. 4 pp. 505–508, 2 figs., 5 refs. Tunis, 1933.

Mathis (C.), Durieux (C.) & Advier (M.). **Transmission naturelle et expérimentale à l'homme du spirochète infectant dans la nature, à Dakar, la tique :** *Ornithodorus erraticus* **vel** *marocanus*.—*Ann. Inst. Pasteur* **52** no. 2 pp. 166–178, 4 graphs, 2 refs. Paris, February 1934. [*Cf. R.A.E.*, B **22** 16.]

Trabut (G.). **Un nouveau cas de myiase oculaire à** *Oestrus ovis*, **à Alger.**—*Arch. Inst. Pasteur Algérie* **11** no. 4 p. 598. Algiers, December 1933. [*Cf. R.A.E.*, B **21** 19].

Parrot (L.). **Notes sur les phlébotomes VI.—Sur une variété nord-africaine de** *Phlebotomus squamipleuris* **Newstead** [var. *dreyfussi*, n., described from a single female from the Algerian Sahara].—*Arch. Inst. Pasteur Algérie* **11** no. 4 pp. 603–605, 4 figs., 4 refs. Algiers, December 1933.

Galliard (H.). **La mue embryonnaire des Hémiptères hématophages.** [The Embryonic Moult of Blood-sucking Rhynchota (*Cimex*, *Triatoma* and *Rhodnius*).]—*C. R. Soc. Biol.* **115** no. 8 pp. 823–824. Paris, 1934.

Rivnay (E.). **The Tropisms effecting Copulation in the Bed Bug** [*Cimex lectularius*, L.].—*Psyche* **40** no. 4 pp. 115–120, 2 figs., 6 refs. Cambridge, Mass., December 1933.

Hobson (R. P.). **Growth of Blow-fly Larvae on Blood and Serum. I. Response of aseptic Larvae to Vitamin B.**—*Biochem. J.* **27** no. 6 pp. 1899–1909, 4 figs., 17 refs. Cambridge, 1933.

Hardy (G. H.). **The Genus** *Tabanus* **in Tasmania.**—*Stylops* **3** pt. 2 pp. 43–48, 13 refs. London, 15th February 1934.

Kröber (C.). **Schwedisch-chinesische wissenschaftliche Expedition nach den nordwestlichen Provinzen Chinas, unter Leitung von Dr. Sven Hedin und Prof. Sü Ping-chang. Insekten gesammelt vom schwedischen Arzt der Expedition Dr. David Hummel 1927–1930. 14. Diptera. 6. Tabaniden, Thereviden und Conopiden** [including 9 new species of Tabanids].—*Ark. Zool.* **26A** no. 8, 18 pp., 13 figs. Stockholm, 1934.

Bequaert (J.). **The Giant Ticks of the Malayan Rhinoceroses : with a Note on** *Ixodes walckenaerii* **Gervais.**—*Psyche* **40** no. 4 pp. 137–143, 2 refs. Cambridge, Mass., December 1933.

Chopra (R. N.). **Conjunctivitis produced by a Ground Beetle** [*Clivina* sp. in Calcutta].—*Indian med. Gaz.* **69** no. 1 pp. 23–34. Calcutta, January 1934.

Neal (W. L.) & Savage (J. de la M.). **An improvised Dissecting Microscope for Entomological Work.**—*Rec. Malar. Surv. India* **3** no. 4 pp. 841–842, 1 fig. Calcutta, December 1933.

Monteiro (J. Lemos) & da Fonseca (F.). **Typho exanthematico de S. Paulo. XI. Novas experiencias sobre a transmissão experimental por carrapatos** (*Boophilus microplus* **et** *Amblyomma cajennense*). **XII. Sobre um virus isolado de ratos da zona urbana da cidade e suas relações com o do typho de S. Paulo.**—*Mem. Inst. Butantan* **7** (1932) pp. 35–40, 3 refs ; pp. 41–50, 15 refs. S. Paulo, ? 1933. (With Summaries in English.) [Recd. February 1934.] [See *R.A.E.*, B **21** 68.]

Fletcher (W.). **Typhus tropical et maladies de la même famille** [summary of present knowledge].—*Bull. Off. int. Hyg. publ.* **26** no. 1 pp. 95–110, 64 refs. Paris, January 1934.

McCulloch (R. N.). **Paris Green - Kaolin Paste as a Blowfly Dressing.** —*Agric. Gaz. N.S.W.* **45** pt. 1 p. 46. Sydney, 1st January 1934.

It has been found that the concentration of the soft soap solution used in making the Paris green and kaolin dressing for sheep attacked by blow-flies [*R.A.E.*, B **21** 282] is excessive when soft water is employed, as it prevents the kaolin from keeping the Paris green permanently in suspension. The formula now recommended is ½–1 oz. Paris green, 6–8 oz. kaolin and 18 oz. soft soap solution of a strength not exceeding 0·5 per cent.

Imms (A. D.). **A general Textbook of Entomology.**—Roy. 8vo, xii+727 pp., 624 figs., many refs. London, Methuen & Co., Ltd., 3rd edn. revd. & enl., 1934. Price, 36*s*.

The third edition of this standard work [*R.A.E.*, B **13** 56; **18** 95] contains many additions and alterations. Much of the portion dealing with anatomy and physiology has been emended or rewritten in order to bring it in line with recent ideas and discoveries. The Diptera have been reclassified under three sub-orders, the old and somewhat unnatural assemblage of the Orthorrhapha being no longer retained; the Calypterate Muscoids have also been grouped more in accordance with recent taxonomy. A number of supplementary references to the literature are given, and certain of the older citations omitted. Some 37 new illustrations have been included.

Pritchard (A. L.). **Do Caddis Fly Larvae kill Fish?**—*Canad. Fld Nat.* **48** no. 2 p. 39. Ottawa, 7th February 1934.

In the spring of 1933, instances were observed in British Columbia of the larvae of Trichoptera grasping the fry of pink salmon (*Oncorhynchus gorbuscha*). In some instances the fish was drawn almost wholly into the larval case and the head apparently chewed.

Romaña (C.). **Investigaciones sobre la enfermedad de Chagas. I–III.** [Investigations on Chagas' Disease, I–III.]—*Publ. Univ. B. Aires Misión Estud. Pat. reg. argent. Jujuy* no. 14, 45 pp., 19 figs. Buenos Aires, 1934.

Investigations in the Province of Santa Fé and the Chaco Territory, Argentina, showed 60 per cent. of *Triatoma infestans*, Klug, in rural dwellings to be infected with *Trypanosoma cruzi* [*cf. R.A.E.*, B **21** 40]. Furthermore, 36 per cent. of adult armadillos were naturally infected, other natural reservoirs being opossums. Several human cases were found, two of which are described in detail. In the second paper the author describes two other cases of trypanosomiasis from this region, and in the third records the discovery of *T. cruzi* in dogs there.

van Thiel (P. H.). **Recherches sur la présence de l'*Anopheles maculipennis* var. *labranchiae* dans les Pays Bas.**—*Bull. Soc. Path. exot.* **27** no. 2 pp. 149–154, 3 refs. Paris, 1934.

In view of the apparent correlation in Italy between the incidence of malaria and the presence of *Anopheles maculipennis* var. *labranchiae*, Flni. [*cf. R.A.E.*, B **21** 212], the author undertook investigations to determine whether the residual malaria existing in certain parts of

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Holland was due to the presence of this variety among the population of var. *atroparvus*, van Thiel. Although there is no apparent difference between the adults of these two races, the egg floats of *atroparvus* are usually clear and smooth and those of *labranchiae* striated. Eggs were obtained from engorged females collected from houses in which persons infected with malaria were found and from piggeries in Franeker (Friesland), where malaria has been prevalent for a number of years, and from piggeries in two villages where malaria is rare or absent. As females with mature eggs appear to be rare in houses, they probably do not remain there long and the transmission of infection from one member of a family to another is therefore unlikely to occur. Eggs in all three localities were almost all of the dappled type.

A fair percentage of eggs from females caught in houses and piggeries in Franeker had striated floats, but as the percentages were similar in all three localities, there is no reason to believe that any race other than var. *atroparvus* is present. On the other hand, the proportion of dappled eggs that had striated floats was larger than the author had previously supposed, and batches of lighter-coloured eggs occurred that might have been identified as var. *labranchiae* if the floats had not been quite clear. It thus appears either that both varieties exist in Holland but cannot at present be clearly separated from one another, or (which the author considers more probable) that the dappled eggs found in Holland all belong to var. *atroparvus* but cannot be distinguished by a uniformly lower degree of striation in their floats from those of the south-European variety, *labranchiae*.

VAN THIEL (P. H.). **Insuffisance des caractères de l'oeuf pour la distinction des races trophiques et biologiques de l'***Anopheles maculipennis* **?—***Bull. Soc. Path. exot.* **27** no. 2 pp. 154–158, 8 refs. Paris, 1934.

The author discusses the question of the morphological differentiation of the races of *Anopheles maculipennis*, Mg., that have been distinguished biologically. He points out that, although at present it is not possible definitely to distinguish var. *labranchiae*, Flni., from var. *atroparvus*, van Thiel [see preceding paper], or var. *messeae*, Flni., from the long-winged form as occurring in Holland, which he considers to be the typical *maculipennis*, by differences in the egg floats [*R.A.E.*, B **21** 212], this character may be of value and should therefore be studied in other countries. He considers the forms of the short-winged race in Holland and the long-winged race in Italy that have striated floats to be respectively extreme forms of var. *atroparvus* and of var. *messeae*, which normally have clear floats [*cf. loc. cit.*]. No clear morphological distinction between the " sub-races " is known, and there may possibly be forms that are similarly transitional in their biological characters. At Mantua, where the Anopheline fauna consists almost entirely of var. *messeae*, malaria occurs to a slight extent owing to the scarcity of cattle. On the other hand, endemic malaria is not observed in areas in Holland where the long-winged race predominates. Experiments showed that not only adults of the third generation of var. *atroparvus* but also some of the second may hibernate and give rise to a new generation in the spring. The findings of Swellengrebel [**18** 228] and Roubaud [**20** 213] with regard to the eurygamy of the long-winged form and the stenogamy of var. *atroparvus* were confirmed.

White (C. T.). **Espèces et nombres de puces trouvées sur les rats, pris à terre, dans le port de Londres.**—*Bull. Off. int. Hyg. publ.* **26** no. 2 pp. 255–257. Paris, February 1934.

During 1932, an investigation was made to determine the flea fauna of rats caught on land in the Port of London. The technique used in obtaining and handling the rats and fleas is described. A total of 497 *Mus rattus* and 231 *M. norvegicus* were examined, of which 242 harboured no fleas. Of the 2,246 fleas obtained, 1,862 were *Ceratophyllus fasciatus*, Bosc, 370 *Leptopsylla segnis*, Schönh. (*musculi*, Dug.), 9 *Ctenophthalmus agyrtes*, Hell., and 5 *Ctenocephalides* (*Ctenocephalus*) *felis*, Bch. The flea index varied from 1·5 in winter to 4 during the summer, the increase in the numbers of *L. segnis* being remarkable. The mean monthly temperature during the year ranged from 38°F. to 66°F. and the average relative humidity from 70 to 87 per cent. The flea index appeared to be correlated with temperature rather than with humidity.

Typhus Fever.—*Ann. med. sanit. Rep. Uganda 1932* pp. 18–26. Entebbe, 1933.

In June 1932, typhus was diagnosed for the first time in Uganda by Dr. T. H. Nolan, in the Kigezi District in the south-west corner of the Protectorate. The local population was highly infested with *Pediculus humanus*, L. The infection of guineapigs inoculated with suspensions of lice from men who had suffered from typhus six weeks previously demonstrated the " endemicity " of infection in lice on immune persons. As they would have been freed from lice in hospital and would be unlikely to infect new ones, it can only be surmised that they acquired infected lice after their return to their homes. Extra-cellular bodies resembling *Rickettsia* were present in all 16 lice dissected, whether from typhus cases or not. As search in two localities where numerous cases of typhus had occurred revealed a very small rodent population with few ectoparasites, rats are not likely to be the reservoir of the disease. During October–December, it reached epidemic proportions and was widespread throughout the district.

[Hargreaves (H.).] **Report of the Government Entomologist, of the Laboratories Division of the Agricultural Department, upon Investigations of Medical Interest undertaken during the year 1932.** —*Ann. med. sanit. Rep. Uganda 1932* pp. 86–90. Entebbe, 1933.

The results of a number of local mosquito surveys in Uganda are given, and control measures are recommended where they are considered economically practicable. In view of the observed dislike of African Anophelines for water rich in decaying organic matter, an experiment was carried out in which large quantities of elephant grass were added to two clay pits. Breeding ceased completely for at least three months in these pits, although it continued in two untreated pits in the neighbourhood. This method, however, encourages the breeding of very large numbers of *Culex pipiens*, L. Observations in the Namanve swamp, which is being afforested, showed that, except at the lake-shore, *Anopheles coustani*, Lav. (*mauritianus*, Grp.), which is not known to transmit malaria, was the chief Anopheline breeding in the untouched swamp, although *A. implexus*, Theo., also occurred in small numbers. *A. gambiae*, Giles, was found in ditches cut to drain the

surplus water and *A. moucheti*, Evans, at the lake-edge, where the swamp water mixes with the clean lake water. The water from a ditch where *A. gambiae* was breeding contained less organic matter than that in the breeding-places of *A. coustani*. Larvae of the latter were found in an acid sphagnum bog, so that a low pH alone is not a sure index of the unsuitability of water for the breeding of Anophelines in Africa. No larvae were found in water in a section of roof gutter left exposed for many weeks, the maximum temperature being 100°F. Species not previously recorded from Uganda are *A. theileri*, Edw., *A. squamosus* var. *cydippis*, de Meillon, and *A. gibbinsi*, Evans (MS).

Preliminary tsetse-fly surveys of two areas in the Gulu District showed that much of the best agricultural land is at present closed to occupation. Many places could probably be settled without the population coming into close contact with the fly, but the presence in this District of *Glossina pallidipes*, Aust., in addition to areas of *G. morsitans*, Westw., and streams infested with *G. palpalis*, R.-D., necessitates careful surveys before decisions can be made. In the course of studies on Simuliids [**22** 44], which usually breed in rivers and streams, the larvae of *Simulium adersi*, Gibbins (MS) were discovered on rocks beaten by the waves of the lake.

MACKAY (R.), BUCHANAN (J. C. R.) & SANDERSON (I.). **Arsenical Poisoning associated with Larvicidal Treatment of Water with Paris green.**—*Trans. R. Soc. trop. Med. Hyg.* **27** no. 5 pp. 517–523, 8 refs. London, 12th March 1934.

The authors describe an outbreak in Tanganyika Territory of chronic arsenical poisoning that affected 132 persons, resulting from the weekly treatment against Anopheline larvae, over a period of 3 months, of 8 water-holes and a weed-covered pool with a mixture of one part Paris green (containing a maximum of 1 per cent. water-soluble arsenic) and 99 parts powdered red earth and fine sand. The dust was applied at the rate of a handful to each hole (of an average diameter of 5–8 feet), with a corresponding rate for the pool, which covered an area of about 160 sq. yds. It has been previously observed that Paris green often floats for days in thick bands, probably formed by the action of the wind, so that poisonous doses are possible [*R.A.E.*, B **16** 150]. The diluent sinks, and the floating particles of Paris green drift towards the edges where the water is drawn. Arsenic was easily detected in water taken a week after the last application of the dust, no heavy rain having fallen during the period. It is suggested that if there is a possibility of treated water being used for domestic purposes, a careful watch should be kept for early symptoms of poisoning, and stationary water should be tested from time to time for the presence of soluble arsenic. At present Paris green is the only larvicide available for use in breeding-places that are densely covered with vegetation.

KOMAROV (A.). **On the Recovery of *Egyptianella pullorum* Carpano from wild *Argas persicus* Oken.**—*Trans. R. Soc. trop. Med. Hyg.* **27** no. 5 pp. 525–526, 11 refs. London, 12th March 1934.

Aegyptianella pullorum was found in the blood of fowls bitten by ticks (*Argas persicus*, Oken) sent from a poultry farm near Tel-Aviv, Palestine, where the fowls were apparently suffering from spirochaetosis. Further experiments showed that the presence of *A.*

pullorum does not protect birds against subsequent infection with spirochaetes and conversely that birds that have recovered from spirochaetosis are susceptible to *A. pullorum*.

Micheletti (E.). **Studio morfologico di alcune larve del gen.** *Gastrophilus* **in un caso di polimiasi gastrica in una zebra** (*Ippotigris chapmani* **var.** *granti*.).—*Ann. Med. nav. colon.* **2** no. 1–2 pp. 460–471, 1 pl. Rome, 1933. (Abstr. in *Bibliogr. ital.* (A bis) **6** no. 12 p. 306. Rome, 1933.)

Larvae of *Gastrophilus*, of which some at least may possibly belong to undescribed species, from the stomach of a zebra from Tanganyika that died at Rome are described and compared with known species from horses and zebras.

Cuthbertson (A.). **Screw-worm, a Pest of Ranch Cattle in Southern Rhodesia.** (Foreword by R. W. Jack).—*Rhod. agric. J.* **31** no. 2 pp. 100–111, 1 ref.; also as *Bull. Minist. Agric. Rhod.* no. 911, 12 pp., 1 ref. Salisbury, February 1934.

In Southern Rhodesia, *Chrysomyia bezziana*, Villen., is the cause of myiasis in cattle, sheep, horses and dogs, but sheep at least are also attacked by other species of blow-fly. The fly has been reported throughout the Colony [*R.A.E.*, B **20** 224], particularly on thickly forested ranches; in open grassy country with sparse bush, it is much less prevalent. The females have been observed at the wounds of cattle and the males feeding on the surface liquids of fresh cow dung, on the "honey-dew" of grasses infected with a fungus (ergot) and also at flowers (*Gymnosporia* sp.); both sexes were seen to emerge from the soil in cattle pens. None of the observations on the life-history suggested new methods of control. The causes of wounds and the means of preventing or treating them are discussed. All egg-masses and larvae should be removed from infested wounds and destroyed. The wounds should then be disinfected, for which purpose undiluted "kerol" has been found satisfactory. Stockholm tar should be smeared thickly with a brush in and round the wounds every three days to repel the fly. Wounds should be inspected daily, and if any egg-masses or newly hatched larvae are found, they should be removed and fresh tar applied. Suppurating wounds that are slow to heal should be cleaned with "kerol," carbolic oil, or some similar substance. On large, open wounds that are repeatedly infested, boracic acid or zinc oxide mixed with a small quantity of iodoform should be dusted to hasten healing. Slaked lime should be used to dry large open wounds that tend to become septic, as such wounds, if not healed quickly, soon became re-infested.

Brown (J. Y.). **The Care, Inspection and Transportation of live** *Anopheles* **for use in Malaria Therapy of General Paralysis.**—*W. Afr. med. J.* **7** no. 1 pp. 78–81, 1 fig. Lagos, July 1933. (Abstr. in *Trop. Dis. Bull.* **31** no. 3 pp. 167–168. London, March 1934.)

Several batches of reared adults of *Anopheles gambiae*, Giles (*costalis*, Theo.) sent to England from Lagos in Barraud's cages [*cf. R.A.E.*, B **17** 255] and kept in the ship's hospital during the voyage failed to arrive in a satisfactory condition; sometimes the cages were covered with moulds and all the mosquitos were dead. As it was thought that they might survive better in the ship's cold room in a state of hibernation, a

batch was kept in a refrigerator at 15°C. [59°F.] for about a month before despatch and a few were alive on arrival. The author took 3,000 uninfected mosquitos and 80 infected with *Plasmodium falciparum* with him to England. The cages were kept in the ship's thawing-out room at about 69°F., but as some of them became mouldy after about a week they were removed to the cabin, where the temperature had fallen to about the same level. Many of the mosquitos had died by the 14th day, and the author then fed the survivors on himself. Some 700 uninfected mosquitos and 8 infected ones were delivered. As they were engorged with blood and refused to feed, the sporozoites from the glands of the infected mosquitos were inoculated into two patients, both of whom developed malignant tertian malaria. The author took 0·06 gm. plasmochin daily, beginning on the day before the mosquitos fed and continuing until 12 days afterwards. He had no malaria until 14 months later, when he had been exposed to fresh infection in Nigeria.

Although about 20 per cent. of the children in Lagos are infected with *Plasmodium malariae* and *A. gambiae* is the only vector, not one of 92 mosquitos of this species became infected when fed repeatedly on three carriers of quartan gametocytes. In the course of rearing at Lagos, it was found that the adults only emerged from pupae at night.

BARRAUD (P. J.). **Family Culicidae. Tribes Megarhinini and Culicini.**—*Fauna Brit. India, Dipt.* **5**, Med. 8vo, xxviii+463 pp., 8 pls., 106 figs., 1 fldg. map, 11 pp. refs. London, Taylor & Francis, March 1934. Price 30*s*.

The present volume concludes the account of the Indian CULICINAE or true mosquitos [*cf. R.A.E.*, B **21** 280], and the work is completed by F. W. Edwards in an Appendix, in which a brief account is given of the distinguishing characters of the family CULICIDAE and its relationships to other Nematocerous Diptera, together with descriptions of the very few Indian members of the other two subfamilies, DIXINAE and CHAOBORINAE.

In the introduction, which is preceded by a bibliography and a systematic index, the author delimits the area dealt with and discusses the distribution, character, and classification of the mosquito fauna. The MEGARHININI do not suck blood and are therefore not carriers of disease. The vectors of dengue in India are probably *Aëdes aegypti*, L., and *A. albopictus*, Skuse, which are common and which transmit the disease in other parts of the world, and possibly allied species. *Culex fatigans*, Wied., one of the most prevalent domestic mosquitos in most parts of the country, appears to be the chief vector of filariasis, although other species may also be concerned.

In the "Systematic" section (pp. 7–426), the author gives keys to the two tribes, the 16 genera and some of the subgenera of the CULICINI, the six Indian species of *Megarhinus* (the single genus of its tribe) and the 239 Indian species of the tribe CULICINI. Where possible, general descriptions are given under tribe and genus and particular descriptions under species of as many stages as are known, and notes are added showing habitat, distribution, Oriental synonymy, etc. References to original descriptions have been given in all cases, and an effort has been made to include all the more important recent systematic references. The larvae of as many as 96 Indian species are as yet undescribed. The descriptions include eight new species and three new varieties, and

one new subgenus and one new name are proposed. In the Appendix, descriptions are given by Edwards of four new species in the subfamily Dixinae, three of *Aëdes* (for two of which a new subgenus is proposed) and one of *Culex*, based chiefly on material submitted by Barraud after the volume had gone to the press. One new species of *Culex* is described from Hong Kong.

Ishii (N.). **On the Tribe Culicini and the Diseases associated with it in Amoy.** [*In Japanese.*]—*Jikken Igaku Zasshi* **16** no. 5 pp. 461–468. Tokyo, 1932.

The Culicines found in Amoy, China, comprise *Aëdes albopictus*, Skuse, *Culex sitiens*, Wied., *A. aegypti*, L., *C. fatigans*, Wied. (*quinquefasciatus*, auct.), *Armigeres obturbans*, Wlk., and *Lutzia* sp., of which the first two are common. Filariasis is rather rare at present, apparently owing to the scarcity of *C. fatigans*, the chief vector [*cf. R.A.E.*, B **21** 157]. Dengue, which is perhaps transmitted by *Aëdes albopictus* and *A. aegypti*, is common in autumn.

Ginsburg (J. M.). **Soap as a Mosquito Larvicide.**—*Science* **79** no. 2044 p. 210. New York, 2nd March 1934.

To investigate a belief that the addition of soap to mosquito larvicides produces a greater increase in toxicity than can be ascribed to improved penetration, the author carried out experiments on larvae and pupae of *Culex pipiens*, L., in water with which was mixed a liquid soap consisting of potassium oleate and coconut oil and containing about 40 per cent. actual soap. The rate of mortality after 24 hours was 100 per cent. when the concentration of soap was 0·2 per cent. or higher.

First Conference of the U.S.S.R. for Aeroplane Use in Malaria Control. Moscow. November, 1931. [*In Russian.*]—*Med. Parasit. parasit. Dis.* **1** no. 2 pp. 65–116. Moscow, 1932. [Recd. February 1934.]

Several of these abridged reports by various authors on the use of aeroplanes for applying larvicides against Anopheline mosquitos deal with various aspects of the organisation of the work in the Russian Union, its value and problems connected with it.

In " The Control of Malaria by Means of the Avio-chemical Method on the Soviet Cotton Farm Kara-Chal in 1931 " (pp. 80–86), V. G. Buduilin gives an account of aeroplane dusting against the larvae of *Anopheles maculipennis*, Mg., over more than 15 sq. miles of water surface in a district in south-eastern Azerbaijan in which similar work (discussed in an appendix, pp. 108–113) was successful in 1930 [*R.A.E.*, B **20** 152]. Other Anophelines found were *A. hyrcanus* var. *pseudopictus*, Grassi, and *A. pulcherrimus*, Theo., which was rare. *A. maculipennis* had 8 generations in the course of about 7 months. Descriptions are given of the various types of breeding-place, which were dusted with Paris green (mixed with a carrier, 1 : 3) from the end of May to October at intervals of 10 days in the first three months and of 6 days in August and September. A dosage of 3½ oz. Paris green to the acre killed all the larvae in 24 hours, irrespective of the type of vegetation. It was necessary to apply Paris green or oil from the ground where trees or telegraph wires hindered the work of the aeroplane, or in small pools, etc., near inhabited houses. The numbers of larvae and adults

of *A. maculipennis* were markedly reduced, and the malaria rate fell by about 53 per cent.

In the " Report of the Evlakh Avio-Section " (pp. 87–88), D. Dzhafarbekov briefly reviews work from the beginning of August to mid-October in central Azerbaijan, where over 27 sq. miles of water surface had to be treated. Nearly 19 tons of Paris green were used, mixed with road dust (1 : 3). All larvae were killed, after sometimes as many as 5–7 treatments.

In " The Control of Malaria in Regions of Rice Cultivation in the North Caucasus " (pp. 88–93), L. A. Zhadkevich gives an account of a campaign in 1931 carried out in rice-fields in a district near the Sea of Azov. Up to August, only 20 per cent. of the larvae were Anophelines (*A. maculipennis*); from the second half of August, 80 per cent. were *A. hyrcanus* var. *pseudopictus*. In experiments in interrupted irrigation [*cf.* **19** 154; **22** 52, etc.], the percentage of larvae killed was directly proportionate to the number of days (2–7) for which the field was kept dry; as many as 90 per cent. could be killed if the moisture content of the soil dropped below 80 per cent. and a dry crust was formed on the surface. Pupae, however, were not killed. This practice favoured the growth of certain weeds, which could only be controlled by deep flooding. Oiling caused severe scorching of the rice, especially of young plants, besides being too expensive. At the period of tillering, when it was thought that the densely growing rice might prevent the dust from reaching the water, a high mortality was obtained from the application of Paris green in strips 360–410 ft. wide from an aeroplane flying at a height of about 23 ft.; 100 per cent. was reached in some of the test dishes when the dosage used to the acre was 10½ oz. Paris green without a carrier. Practically no first-instar larvae or pupae were killed. The survival of some larvae was due to uneven distribution of the dust and its failure to penetrate the thick growth of the plants.

" An Experiment in the Application of the Avio-chemical Method in the Control of Malaria in Stalingrad " (p. 94), by V. A. Kudryavtzev, and the " Report of the Middle-Volga Avio-Detachment " (p. 95–97), by N. M. Zhukov, deal with promising results obtained from aeroplane dusting after July. In Stalingrad, where about 60 sq. miles of water were treated at intervals of 10 days, 97 per cent. of the young larvae and all the older ones were killed. Dusting in the Samara district proved very difficult owing to winding streams, etc. As most of the water occurred under a cover of reeds, bushes or trees, the dosage of 3½ oz. of Paris green per acre had to be increased to 7–14 oz., which killed 94·3–100 per cent. of all instars.

In " An Experiment in the Application of the Avio-chemical Method in Uzbekistan " (pp. 97–103), L. M. Isaev discusses the causes of the survival of mosquito larvae in the various water reservoirs that were dusted 4–6 times in 7 weeks. It occurred in a wide strip of water near the bank, and in a number of isolated places, and was due to the presence of trees near the edge, or of telegraph poles, buildings, or even small hills, all of which interfered with the flight of the aeroplane. By flying higher (50–65 ft. instead of 26–32) and further from the water's edge, the area untreated was reduced, but the distribution of dust was less even. Moreover, owing to defects in the dusting apparatus, it was impossible to obtain a sufficiently wide effective strip of dust or an even release. The Paris green did not injure fish, cattle or the aquatic vegetation.

Morin (H. G. S.), Moreau (P.) & Toumanoff (C.). **Recherches sur le paludisme au Tonkin. II. Bassin du Si-Kiang.—Region de Langson—Cao-bang.**—*Bull. Soc. méd. chir. Indochine* **11** no. 3 pp. 256–289, 4 diagr., 14 refs. Hanoi, 1933.

The north-east frontier region, or upper part of the Si-Kiang Basin, is separated from the rest of Tonkin by a barrier of mountains and has a more equable climate. Preliminary epidemiological and entomological surveys were undertaken during 1931 and 1932 in the strip of country descending from Kao-bang to Lang-son, and malaria was found to be moderately endemic and well tolerated by the indigenous population. As in the rest of Indo-China, it is focal [*R.A.E.*, B **22** 45] and closely associated with local physiography. The spleen index is low and the blood index variable, both characteristic of a zone of light endemicity. On the other hand, 15 species of Anophelines were found, including all those recognised as vectors in the Red River Valley [**21** 31], and 3 out of 69 examples of *Anopheles minimus*, Theo., taken in houses were found to be naturally infected (in December). The comparatively light endemicity of malaria appears to be due partly to the physiography of the region, by which the relatively active foci of the disease are isolated, but chiefly to climatic influences. In May, *A. minimus* was more abundant in this region than in the high valley zone of the Red River Basin [**21** 190], owing possibly to the lower temperatures prevailing. On the other hand, the sum of the captures of this Anopheline for corresponding months (December, February and May) was lower in the frontier region than in the high valley zone. In February, the numbers of larvae captured were relatively much larger than the numbers of adults, and it is suggested that the larval development is retarded by the lower temperatures; thus the numbers of adults and incidentally their chances of contact with man are reduced. It is believed that the mildness of the disease in this region and the rarity of serious cases may be due to the increased resistance of man, including the ordinarily susceptible Annamese and Europeans, under the more favourable climatic conditions.

At certain points, where a high incidence of malaria is directly due to the proximity of breeding-places of *A. minimus*, permanent anti-mosquito measures are desirable, but for the country as a whole it is considered that the application of temporary anti-larval measures during the cold weather (March and April) before the adults invade houses and the treatment of sporadic cases in man will bring about a gradual retrogression in the incidence of the disease.

Morin (H. G. S.). **Le problème des moustiques dans les centres urbains du Tonkin.**—*Bull. Soc. méd. chir. Indochine* **11** no. 3 pp. 300–305, 1 ref. Hanoi, 1933.

The success of certain measures against Anophelines in parts of Tonkin has led to a demand on the part of the population for the destruction of mosquitos in general. The author points out the comparative simplicity of organising measures against Anophelines of which the biology is known and the difficulty of a campaign against other mosquitos of varied species and habits. Small villages in the delta surrounded by well kept, carefully weeded rice-fields with smooth-sided dikes, containing only the upright, regularly spaced rice plants and an abundance of small fish and insectivorous insects, are practically

free from mosquitos. Fish-ponds, ponds where aquatic plants are grown for feeding pigs, and, in general, large collections of water with well kept edges (sometimes cemented) are seldom breeding-places of large numbers of Culicines. On the other hand, small collections of dirty water, neglected pools in fallow rice-fields, irregular excavations overgrown with vegetation where rain-water collects, and various domestic receptacles form the preferred breeding-places. As they are more often abundant in towns than in villages, the seeming paradox that adult mosquitos in Tonkin are most often found in towns is easily explained. A campaign against such mosquitos is therefore difficult. The removal of unused water is of primary importance. At least the edges of pools can be made of beaten mud or masonry and the water can be freed from all horizontal vegetation, but the suppression of domestic water reservoirs and washing pools would involve the installation of a drinking-water system, public baths and sewers.

TOUMANOFF (C.). **Quelques faits nouveaux concernant le rôle de la variété tonkinoise de *A. jeyporiensis* James dans la transmission du paludisme.**—*Bull. Soc. méd. chir. Indochine* **11** no. 3 pp. 309–312, 7 refs. Hanoi, 1933.

In view of possible doubts as to the ability of the Tonkin variety of *Anopheles jeyporiensis* [var. *candidiensis*, Koidz. (*cf. R.A.E.*, B **21** 280)] to transmit malaria, the author points out that of the three individuals found naturally infected in the Red River Basin [**20** 62] two contained oöcysts in an advanced stage of development (4 out of 16 oöcysts in one and 2 out of 11 in the other being full of mature sporozoites). Moreover, of mosquitos of this variety dissected in 1932 and 1933, three were found infected (at the end of October, the middle of November and the beginning of March), one in the glands alone and the others in both glands and gut. This species may thus be found infected in the winter season (November), in the rainy season (May) and in the transition periods (April and October) and, with *A. maculatus*, Theo. [**21** 122], may be considered an important supplementary vector in parts of Tonkin where malaria is hyper-endemic.

TOUMANOFF (C.). **Recherches sur la transmission du paludisme au Tonkin.**—*Arch. Inst. Pasteur Indochine* no. 17 pp. 59–102, 1 pl., 1 fldg. map, 2 fldg. tables, 4 graphs, 35 refs. Saigon, 1933. [Recd. March 1934.]

This account of Anophelines and malaria in the Red River Basin of Tonkin covers the 28 months ending in April 1933 and completes the preliminary report already noticed [*R.A.E.*, B **21** 31]. The percentages of infection of *Anopheles minimus*, Theo., were 1·56, 1·7 and 3·52 in the second, third and fourth zones respectively [*cf.* **21** 190]. It is concluded that in all studies on species of *Anopheles* and their infectivity, at least in the Far East where they are numerous, the physiography of the locality should be taken into account. Wherever the number of dissections was about 100, the infectivity in *A. minimus* ranged between 3 and 4 per cent. During the 10 months since the preliminary study, three cases of gland infections in *A. jeyporiensis* var. [*candidiensis*, Koidz.] were found [see preceding abstract], showing its importance as a vector, particularly in the third and fourth zones. The two cases of gut infection in *A. aconitus*, Dön., appear to be isolated,

and the importance of this species as a vector is doubtful. Infection in *A. maculatus*, Theo., and *A. vagus*, Dön., has already been discussed [**21** 122, 220].

MORIN (H. G. S.) & MARTIN (P.). **Possibilités d'utilisation pratique du vert de Paris en Indochine.**—*Arch. Inst. Pasteur Indochine* no. 17 pp. 103–140, 4 pls. (2 fldg.), many refs. Saigon, 1933. [Recd. March 1934.]

After discussing the merits of substances other than oils for use against Anopheline larvae, the authors describe both laboratory and field experiments (covering a period of nearly two years) that demonstrate the effectiveness of Paris green for this purpose under various conditions in Indo-China. The Paris green used contained at least 50 per cent. arsenic trioxide. Of numerous carriers tested, the best was siliceous road dust, which was heavy enough to throw but light enough to float on the water and was also found to be itself toxic under some conditions to Anopheline larvae of certain species. As it is slightly heavier than Paris green, it is improved by being mixed at the rate of 9 parts to 1 with finely powdered charcoal. Data are given on the time of application, the choice of brands of Paris green and of diluents, and the methods of sifting the carrier, preparing the mixture and applying the dust. Means of ascertaining that it has been properly applied and of testing its effect are also discussed. Apparatus for sifting and mixing is illustrated in detail. A 1 per cent. mixture of Paris green and dust applied at the rate of 1½ pints to 100 sq. yds. is recommended. As Anopheline larvae feed during the day when it is not too hot, dusting should be done in the early morning after the dew has risen. In order not to disturb them, as little noise as possible should be made near the treated breeding-places, and no one should be allowed to remain in the neighbourhood immediately after treatment. In Tonkin, larval development in spring and autumn takes only 6–7 days, and dusting should therefore be carried out every 4 days, but in winter and the height of summer it may take as long as 20 days, and dusting every 10 or 15 days is theoretically sufficient, though weekly applications are more satisfactory.

Experiments on dusting by means of aeroplanes are also discussed, and the apparatus used is described and illustrated. Road dust was again found to be the most satisfactory diluent. The mixture may be made with 7 parts of Paris green to 93 of road dust, but should be altered according to the results obtained. The components should be mixed only a short time before use, in order to minimise any effect of the damp atmosphere. In the authors' experiments, a rate of approximately 8 oz. of Paris green in a 7 per cent. mixture to 2½ acres proved satisfactory. The aeroplane should fly slowly at a height of about 100 ft. and cover a width of 220 yds. at a time. The uniformity of distribution of the dust and the concentration of Paris green were determined by examining glass plates covered with vaseline that had been placed at various points.

MORIN (H. G. S.) & BADER (H.). **Sur quelques facteurs physico-chimiques de l'oecologie larvaire des anophèles au Tonkin. (Deuxième note.)**—*Ann. Inst. Pasteur* **52** no. 3 pp. 332–351, 1 fig., 3 graphs, 2 refs. Paris, March 1934.

The first part of this paper deals with laboratory experiments made in connection with the finding that the breeding of Anophelines in Tonkin

is most abundant in waters having a high content of free dissolved carbon dioxide [*R.A.E.*, B **22** 31]. It is concluded that a large part of the dissolved carbon dioxide is derived from the direct action of water on the soil, the quantity produced being dependent on the composition and conformation of the soil, the temperature, the duration of contact and above all the relative proportions of soil and water. It thus appears that fauna living in water or on damp soil is in contact with proportions of carbon dioxide that vary considerably according to circumstances, probably according to season, and perhaps even from year to year.

As Anophelines have been found breeding in water containing as much as 2 per cent. of sodium chloride, and most of the surface water in Tonkin is rich in minerals, further experiments were undertaken to determine the effect of sodium, potassium and ammonium chlorides on the solubilities of calcium and magnesium carbonates, both in plain water and in the presence of carbon dioxide. The results suggest the possibility of holding a large quantity of carbonic acid in a nascent state under ordinary pressure by means of magnesium carbonate in the presence of sodium chloride, a result that could not otherwise be obtained except under a pressure of several atmospheres. Moreover, they show how far the equilibria reached in complex liquids such as natural waters may differ from the simple ones ordinarily studied in chemistry, such as those that obtain between distilled water, a carbonate and carbonic acid. The presence of a dissociable electrolyte such as sodium chloride may entirely alter the nature of the phenomenon.

In certain of the lower parts of Tonkin, permanent breeding-places of *Anopheles minimus*, Theo., are not infrequently found in clayey depressions in obviously compact and homogeneous soils, although this species usually breeds in springs and streams. This suggested that the renewal of the water, which seems necessary for the abundant breeding of this species, might, against all appearances, be made through the apparently compact and homogeneous bottom of the pool, particularly as in one place obviously non-aquatic vegetation was found growing in a shallow depression in 2–4 ins. of clear water (such as could not be found in neighbouring pools) after three months of almost complete drought. Experiments showed that the impermeability of a homogeneous layer of clay forming the bottom of a depression is brought about by compression resulting from a greater pressure exerted from above downwards than from below upwards. If the degree of pressure is reversed, the clay may become permeable from below upwards. As the increase in rainfall occurs about a month earlier in the higher parts of the valley of the Red River and its affluents than in the lower ones, the delta of Tonkin is filled with water before the local rains begin. Owing to the embankment of the canals, the water of the River and its tributaries is constantly at a much higher level than that in the rice-fields, and at this season there may be an upward pressure from the lower water-bearing layers that is not counterbalanced, as is the case later, by the downward pressure of accumulated rainfall. The lowering of the river level does not bring about a drying of the rice-fields, which only return to their original state after several months of evaporation and absorption of water by the vegetation, so that the facts cannot be explained by the hypothesis of a direct communication through easily permeable soil. Thus it is not improbable that certain pools may periodically receive supplies of water from lower layers through a bottom that is impermeable from above downwards, and

that they may therefore present, at certain seasons, the same characteristics as waters in which larvae of *A. minimus* are normally found. The study of seasonal variations in the "carbonic index" [*loc. cit.*] may afford a means of distinguishing pools of this type from those of similar appearance.

HECHT (O.). **Experimentelle Beiträge zur Biologie der Stechmücken V.** [Experimental Contributions to the Biology of Mosquitos. V.] —*Arch. Schiffs- u. Tropenhyg.* **38** no. 3 pp. 124–131, 1 fig., 6 refs. Leipzig, March 1934.

The author's experiments on the temperature preferred for oviposition by *Anopheles maculipennis*, Mg. [*R.A.E.*, B **19** 142] were repeated in 1932 with two of the three races of this mosquito that occur in Germany [**20** 58], *viz.*, those laying dark (barred or black) eggs and half-grey (dappled grey) eggs, respectively [*cf.* also **21** 211, 234, 259]. Of 10,900 dark eggs, 34 per cent. were laid in water at approximately 29°C. [84·2°F.], 30 per cent. at about 25°C. [77°F.] and 36 per cent. at about 19°C. [66·2°F.]. Of 9,940 half-grey eggs, the corresponding percentages were 47·3, 39·3 and 13·4. In other experiments, with water at 24–25°C. [75·2–77°F.] and 17–18°C. [62·6–64·4°F.], 68 per cent. of 1,550 dark eggs and 96 per cent. of 8,080 half-grey ones were laid in the warmer water. It is therefore apparent that the race laying eggs of the latter type is more markedly restricted to higher temperatures.

In 1933, gravid females from regions where these races are believed to occur almost unmixed [*cf.* **21** 233] were placed in separate cages, each with two dishes of water, one at 34°C. [93·2°F.] and one at 28°C. [82·4°F.]. Both types of eggs were often found in the same dish, and these ovipositions were ignored. Of 5,745 dark and 2,810 half-grey eggs, 38·6 and 46·1 per cent. respectively were laid in the warmer water, so that there was no significant difference in the choice of temperature.

WEYER (F.). **Verlauf der Malaria in Ostfriesland 1932 und 1933.** [The Course of Malaria in East Friesland in 1932 and 1933.]— *Arch. Schiffs- u. Tropenhyg.* **38** no. 3 pp. 131–132, 2 refs. Leipzig, March 1934.

Malaria (benign tertian) in the Emden district of East Friesland, the only one in Germany where it is endemic [*cf. R.A.E.*, B **21** 258], is epidemiologically comparable to that in Holland [*cf.* **18** 52, 53]. It is not certain whether the infection, which appears in spring, is acquired in autumn or in mid-summer. In dwellings, especially in bedrooms, *Anopheles maculipennis*, Mg., was most abundant in June and July. In 1933, the number of cases due to new infections was 181, as against 22 in 1932, probably because the temperature during the critical period (June–September) in 1932 averaged 16·5°C. [61·7°F.] as against 14·9°C. [58·82°F.] in 1931, the threshold of development for *Plasmodium* [*vivax*] being 16°C. [60·8°F.] and the optimum 25°C. [77°F.].

WEYER (F.). **Beobachtungen an Hausanophelen im Zusammenhang mit der Rassenfrage bei** *Anopheles maculipennis*. [Observations on Anophelines in Dwellings in Connection with the Problem of Races of *A. maculipennis*.]—*Z. Parasitenk.* **6** no. 3 pp. 288–307, 23 refs. Berlin, 18th December 1933.

The author discusses the results of observations on the races of *Anopheles maculipennis*, Mg., in East Friesland and Upper Bavaria

[*R.A.E.*, B **21** 258, 259]. The proportion of mosquitos in dwellings to those in animal quarters was considerably higher in the latter region. Investigations of the stomach contents showed that only a few of the mosquitos had flown any considerable distance after feeding and also that they attacked cattle in pastures as well as in stalls [*cf.* **21** 258]. About 70 per cent. of the mosquitos from dwellings in East Friesland contained human blood. Experiments in which the race of the mosquitos was determined from the eggs they laid showed that, in a district where almost all those in animal quarters belong to the race *atroparvus*, van Thiel, a very high proportion of race *messeae*, Flni., may occur in dwellings. This may be explained by microclimatic preferences.

PAINE (R. W.). **The Introduction of *Megarhinus* Mosquitos into Fiji.**—*Bull. ent. Res.* **25** pt. 1 pp. 1–32, 1 pl., 1 fig., 9 refs. London, March 1934.

A detailed account is given of the introduction of *Megarhinus splendens*, Wied., from Java into Fiji for the control of *Aëdes scutellaris*, Wlk. (a preliminary report of which has already been noticed [*R.A.E.*, B **20** 237]), together with observations on its bionomics made during the course of the work.

The following is largely taken from the author's summary : During the latter half of 1930, early stages of *M. splendens*, the most abundant and widespread species of its genus in Java, were collected from tree-holes, bamboo stumps and tubs in Buitenzorg. Preliminary experiments showed that the minimum life-cycle from egg to adult occupied 24 days, and that larvae would mature normally on a reduced diet after a development lasting as long as 2 months. A total of 238 larvae out of 283 survived the journey of 28 days from Java to Fiji, and 51 colonies, comprising nearly 3,000 individuals, were bred and liberated between February 1931 and April 1932. Adults emerging from pupae placed in barrels in the field do not disperse, but remain in the vicinity to pair and finally oviposit in the barrels in the absence of other breeding-places. Larvae were collected from the barrels when they reached the third instar and fed in captivity until they pupated, the pupae being liberated on various islands of the Group. By the end of 1931, *Megarhinus* had been recovered from natural breeding-places at 6 points and it is now well established, the most favourable country for colonising being the swamp land with trees of *Inocarpus edulis*, which occurs near the coasts on many islands. In most places, in the forest especially, it spreads very slowly, undergrowth making an effective barrier to its flight. It breeds in tree-holes and very occasionally in tins, but as it is unlikely to be found in rock pools, coconut husks, etc., the other common breeding-places of *A. scutellaris*, it seems improbable that it will reduce the numbers of this mosquito by more than 5 per cent. in Fiji.

The incubation period occupies about 2 days, the larval stage a minimum of 16 days when food is abundant and a maximum of 134 when food is scarce, and the pupal stage 6 days. The minimum period for a generation is about 30 days, very little difference being noted in the rate of development in Java and Fiji in spite of the lower average temperature in the latter. The adults are active during the day but pair when settled, not when in flight. The eggs are dropped singly on water, where they float on the surface film. Oviposition continues over several weeks and is most prolific during sunny weather. The larvae

feed on tadpoles and the larvae of Tipulids, *Chironomus* and mosquitos, including their own species.

In May 1933, a small colony of *M. inornatus*, Wlk., was introduced into Fiji from New Britain, where it has been found to breed in coconut husks. Its immature stages are of similar duration to those of *M. splendens*, and it would therefore appear unlikely to reach maturity in coconut husks in Fiji, where the water evaporates too rapidly.

NICHOLSON (A. J.). **The Influence of Temperature on the Activity of Sheep-blowflies.**—*Bull. ent. Res.* **25** pt. 1 pp. 85–99, 1 fig., 7 graphs, 10 refs. London, March 1934.

As it was thought that a knowledge of the influence of temperature on the activity of blow-flies would be of value in interpreting the results of trapping them in the field and in the prediction of the conditions and districts in which they would be active, experiments were undertaken at temperatures ranging from 0 to 45°C. [32–113°F.], using *Lucilia cuprina*, Wied., *L. sericata*, Mg., *Chrysomyia rufifacies*, Macq., and *Calliphora stygia*, F., four species of particular importance in the sheep blow-fly problem in Australia.

The following is largely taken from the author's summary : Details are given of the apparatus used and of the quantitative methods of recording activity. With constant temperatures the greatest activity occurred near the centre of the temperature range, whereas in an experiment with a progressively rising temperature (in which *L. cuprina* alone was used) it immediately preceded the upper thermal death-point. When the temperature is rising, activity occurs at a lower range than when it is constant, and " distress activity " appears at high temperatures. For the development of the necessary energy for full crawling and flight activity at the most favourable temperatures, rather long exposure to them is necessary. Flight and, to a less extent, crawling occur in bursts of activity, whether the temperature is rising or constant. The zone of activity of *L. cuprina* is higher and its zone of intense activity definitely narrower than the corresponding zones of *L. sericata* ; this lends support to the argument that the differences that have led to the evolution and separation of species may be inconspicuous ones that cannot be recognised by taxonomists. The curves for general activity and temperature preference correspond to the known distribution of the four species examined. It is shown that activity is a complex phenomenon and that the character of the results obtained is influenced by the kind of activity examined, by the methods of measurement used, and by the nature of the temperature conditions to which the insects are exposed.

TRENSZ (F.). **De l'influence des rayons solaires sur le cycle évolutif de *Aëdes mariae*.**—*C. R. Soc. Biol.* **115** no. 10 pp. 1108–1110, 2 refs. Paris, 1934.

The author points out the difficulty of rearing *Aëdes mariae*, Serg., in the laboratory. Mosquitos reared from egg to adult in diffused light in either fresh or salt water were for the most part sterile. The breeding-places of this species in Algeria are usually exposed to sunlight, and it was found possible to rear several generations successfully if the receptacles containing the eggs and larvae were placed in the sunlight for several hours each day.

PAPERS NOTICED BY TITLE ONLY.

BRUMPT (E.). **Fréquence saisonnière et diapause larvaire de la mouche** *Lucilia bufonivora*.—*C. R. Acad. Sci.* **198** no. 2 pp. 206–208, 1 ref. Paris, 1934.

BRUMPT (E.). **Recherches expérimentales sur la biologie de la** *Lucilia bufonivora*.—*Ann. Parasit. hum. comp.* **12** no. 2 pp. 81–97, 6 figs., 51 refs. Paris, 1st March 1934.

WEDDELL (J. A.). **The House Fly** [a brief popular account of the bionomics and control of *Musca domestica*, L.].—*Qd agric. J.* **41** pt. 1 pp. 43–47, 1 pl.; also as *Ent. Leafl. Dep. Agric. Stk Qd* no. 28, 6 pp., 1 pl. Brisbane, 1st January 1934.

SCHILLING (C.) & others. **Immunization against Trypanosomiasis.**—*J. trop. Med. Hyg.* **37** no. 5 pp. 70–72. London, 1st March 1934. [*Cf. R.A.E.*, B **22** 13.]

GIOVANNOLA (A.). **Caratteristiche alterazioni delle glandole salivari dell'***Anopheles maculipennis* **infetto da parassiti malarigeni.** [Characteristic Changes in the Salivary Glands of *A. maculipennis* infected with Malaria Parasites.]—*Riv. Malariol.* **12** no. 6 pp. 1140–1146, 2 pls. Rome, 1933. (With Summaries in Italian p. 1146, French p. 1215, English p. 1217, German p. 1219.)

LI (FENG-SWEN) & WU (SHIH-CHENG). **The Classification** [with key] **of mature Larvae of Chinese Anopheline Mosquitoes.** [*In Chinese.*] —*Ent. & Phytopath.* **2** nos. 1–5 pp. 3–14, 22–32, 43–52, 62–66, 82–93, 91 figs., 23 refs. Hangchow, 1934. (With a Summary in English.)

ROBIN (L. A.). **Sur l'incidence de l'endémie palustre en Indochine méridionale et ses variations de 1926 à 1932.**—*Arch. Inst. Pasteur Indochine* no. 17 pp. 11–58, 18 graphs, 18 refs. Saigon, 1933. [Recd. March 1934]. [*Cf. R.A.E.*, B **22** 15.]

CHESNEAU (P.) & NGUYEN-DUY-HA. **Deux cas de myiase cutanée à** *Chrysomyia bezziana* [in man in Annam].—*Bull. Soc. méd. chir. Indochine* **11** no. 3 pp. 306–308. Hanoi, 1933.

PHISALIX (Mme.) & HOUDEMER (E.). **Contribution à la faune vénimeuse** [including insects and Arachnids] **du Tonkin.**—*Bull. Soc. Path. exot.* **27** no. 2 pp. 178–184, 4 refs. Paris, 1934.

HORVÀTH (G.). **Description de deux Cimicides nouveaux des chauves-souris (Hem.)** [*Cacodmus* spp. from Tunisia].—*Bull. Soc. ent. Fr.* **39** no. 2 pp. 22–23, 2 figs. Paris, 1934.

[IOFF (I. G.) & TIFLOV (V. E.).] **Иофф (И. Г. и Тифлов (В. Е.). Materialen zum Studium über die Flöhe der U.d.SSR. I. Gattung :** *Stenoponia* **J. et R.** [*In Russian*, with tabulated key to the 10 palaearctic species, including 6 new ones from Asiatic Russia.]—*Rev. Microbiol.* **12** no. 3 pp. 199–210, 15 figs., 15 refs. Saratov, 1934. (With a Summary in German.)

GIL COLLADO (J.). **Nuevos datos sobre Pupíparos españoles y marroquies (Dipt. Pupip.).** [New Data on Spanish and Moroccan Pupipara.]—*Eos* **8** no. 4 pp. 317–323. Madrid, 31st December 1932. [? 1933. Recd. March 1934.]

La Face (L.). **Contributo allo studio della biologia delle diverse razze di *Anopheles maculipennis*.**—*Riv. Malariol.* **12** no. 6 pp. 1069–1114, 1 fig., 21 refs. Rome, 1933. (With Summaries in Italian, p. 1213, French p. 1214, English p. 1216, German p. 1218.) [Recd. March 1934.]

The races of *Anopheles maculipennis*, Mg., in Italy [*R.A.E.*, B **21** 177] are distinguished as typical *maculipennis* (var. *basilei*, Flni. [*cf.* **21** 136, 212]), *messeae*, Flni., *labranchiae*, Flni., and *atroparvus*, van Thiel.

The following is taken from the author's summary of studies on their biology in 1931–33 : All the races continued feeding in winter when the environment was suitable, but *labranchiae* and *atroparvus* showed a greater inclination to do so. Females of these two races fed on blood and kept in warm surroundings laid eggs readily throughout the winter, which hatched normally. They were matured at fairly low temperatures, but below 18°C. [64·4°F.] they were not usually laid, even if the ovaries were quite mature. The typical *maculipennis* and *messeae*, even at temperatures of 27°–28°C. [80·6°–82·4°F.] laid eggs only after repeated blood-meals, and these hatched slowly or (very often) not at all. Even in *labranchiae* and *atroparvus*, however, gonotrophic concordance [*cf.* **18** 53] was not constant. Egg-maturation occurred less readily (after more blood-meals and more slowly) at the beginning of winter than later (end of December or early January), even though there had been no intervening rise in temperature. It thus appears that, in the sequence of the annual generations of all races of *A. maculipennis*, there is interposed periodically a phase in which ovarian activity is retarded by certain internal factors, possibly by hereditary cyclic poisoning [*cf.* **14** 123 ; **19** 187]. In *labranchiae* and *atroparvus*, but not in the other races, this ovarian inertia yields to external influences. It seems evident that hibernation is due to the combined action of internal and external factors, operating differently on the different races and probably also on the same race in different localities.

Many observations appeared to show that blood-meals at a low temperature and also sugary liquids produce hypertrophy of the fat-body instead of direct growth of the ovaries. On the other hand, the fattening of females that have never fed as adults or have scarcely begun to digest ingested blood suggests that hypertrophy may be due to independent causes [*cf.* **20** 175].

Landeiro (F.). **Un appareil à tamiser pour l'emploi du vert de Paris.**—*Riv. Malariol.* **12** no. 6 pp. 1165–1168, 5 figs., 1 ref. Rome, 1933. (With Summaries in Italian p. 1214, French p. 1216, English p. 1218, German p. 1220.) [Recd. March 1934.]

A simple apparatus is described for sifting the road-dust or ash used as carriers for Paris green in work against Anopheline larvae. Inside a box with one side open, standing on four feet, is suspended an oscillating double sieve formed of two wire screens, sloping slightly downwards towards the open side. The upper screen is of galvanised iron wire and the lower one of brass wire, with 7 and 12 meshes per centimetre respectively.

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Piccininni (F.). **Relazione sulla campagna antimalarica in provincia di Milano durante l'anno 1932.** [Report on the Anti-malaria Campaign in the Province of Milan during 1932.]—*Riv. Malariol.* **12** no. 6 pp. 1169–1192, 1 map. Rome, 1933. (With Summaries in Italian p. 1192, French p. 1216, English p. 1218, German p. 1220.) [Recd. March 1934.]

In 1932, there were 2,526 cases of malaria in the Province of Milan. Work in the rice-fields was carried out in accordance with the findings of the preceding year [*R.A.E.*, B **21** 116]. Carp bred in a large pond were allowed to spread along channels into the rice-fields, from which they were driven back at harvest time. This pond, however, was itself found to be an active centre of *Anopheles maculipennis*, Mg., because of the dense aquatic vegetation in it, and the clearing of this was legally prohibited from 1st March to 31st October to avoid destroying the spawn deposited on the plants. In experiments, Paris green proved to be harmless to rice plants and was not absorbed by them. It was, however, difficult to apply and therefore ineffective when the plants were advanced in growth.

Of the adult Anophelines identified, 3,597 were *A. maculipennis*, 19 *A. claviger*, Mg. (*bifurcatus*, auct.) and 10 *A. hyrcanus* var. *pseudopictus*, Grassi. As there is little malaria in the province in proportion to the numbers of Anophelines, it was sought to ascertain which races of *A. maculipennis* were present. Of egg-rafts from various localities, 136 consisted of black eggs (var. *messeae*, Flni.), 15 of grey (var. *labranchiae*, Flni.) and 30 of banded ones.

Sautet (J.). **Paludisme d'hiver en Corse : ses rapports avec le peuplement anophélien homodyname.**—*Riv. Malariol.* **13** no. 1 pp. 97–103, 8 refs. Rome, 1934. (With Summaries in French & Italian p. 102.)

Some of the information contained in this account of observations on *Anopheles maculipennis*, Mg., in Corsica has already been noticed [*R.A.E.*, B **22** 49]. Malaria occurs chiefly, but not solely, in the coastal zone, where salt-water breeding-places are numerous and where a homodynamic race that may be considered the principal vector occurs. The population of winter shelters was found to be constantly renewed ; after the collection of all mosquitos present at one visit, about the same number were again found at the next. Not only do the mosquitos make nocturnal flights, but about 10 per cent. of those taken in winter shelters are engorged. Experimentally, it was found that the mere disturbance of the mosquitos induced a desire to feed even without reactivation by heat, and that eggs might be laid immediately on the removal of an unengorged female to the laboratory. It is suggested that the mosquitos avoid sheltering in houses because in winter these are usually full of smoke. The author points out that these remarks apply only to the particular cases studied, for in the different parts of Corsica, plains, valleys and mountains, all types of winter diapause are found among adults of *A. maculipennis*.

Cases of primary malaria in winter are rare, but observations on six (five due to *Plasmodium falciparum* and one to *P. malariae*) showed that the disease can be contracted in winter and that the symptoms occur immediately, not after a prolonged incubation as in the case of *P. vivax* in Holland [**18** 52]. Infection is sporadic, and

there appears to be no family focus such as is common in spring, summer and autumn ; the disease seems often to be contracted in the open air.

TEDESCHI (C.) & SCALAS (A.). **Contributo alla biogeografia della malaria in Burhacaba (Benadir).**—*Riv. Malariol.* **13** no. 1 pp.104–113, 1 pl. Rome, 1934. (With a Summary in English.)

An investigation of the malaria situation in the village of Burhacaba, Italian Somaliland, was carried out from June 1932 to January 1933. A quarter of the population had a malarial enlargement of the spleen, malignant tertian [*Plasmodium falciparum*] being the prevailing form of infection. There are no streams in the district, water being obtained from wells and rain-tanks. Anopheline larvae were found in small rock pools containing rain water and in water that had leaked from one of the tanks. The species of mosquitos observed are recorded in an appendix by E. Zavattari. *Anopheles gambiae*, Giles, and Culicines, including *Aëdes aegypti*, L., were abundant, and *Anopheles rhodesiensis*, Theo., occurred in small numbers.

HARDY (G. H.). **Two new Methods used in the Breeding and Preparing of Maggots for Medical Purposes.**—Fol., 2 pp. multigraph. Brisbane, Queensland Univ., 9th February 1934.

Blow-fly larvae are being used in Brisbane for treating osteomyelitis, and cures are being achieved without complications. The flies employed are *Lucilia sericata*, Mg., and *L. cuprina*, Wied., both of which are readily reared, but tests show that all kinds of carrion-feeding blow-flies may be used ; even the hairy maggots of the genus *Chrysomyia* are harmless [*cf. R.A.E.*, B **21** 235] and do not burrow into the living flesh, a finding contrary to the impression gained from the reported habits of these flies on sheep.

From a long series of feeding experiments, it was concluded that the rate of growth of the larvae was dependent on the rate at which they imbibed food, and experiments were then carried out to determine whether by adulterating the food the growth of the larvae could be retarded. When fed on meat broth (1 lb. meat to about $1\frac{3}{4}$ pints water) that had been cleared by straining and filtering out all solids and solidified with 2 per cent. agar, larvae were retained for more than a week in the first instar, making very little growth. Some were given tainted meat after 5 days and in the subsequent 2 days grew into normally large maggots and later completed their metamorphosis. Other tests showed that in this medium larvae can live 15 days, changing into the second instar about the tenth day, and it is therefore expected that for clinical use they could be retarded in growth for at least 7 days without losing their efficiency. This method is simpler and cheaper than subjecting the larvae to cold, and it permits their transmission by post.

A method of sterilising the eggs that saves about a quarter of an hour in handling is also described. After being separated in sterile water (used lukewarm in winter) [**20** 125], the eggs are spread over the sides of the glass tube, and Bonney's Blue, which causes them to cling to the sides of the tube, is poured in up to the lip. After the necessary 3–5 minutes' immersion (immersion for 45 minutes does not injure the eggs), the dye is strained off and the tube washed out three times with sterile water, leaving the eggs dyed blue. They are then transferred

to the sterile rarified food, which may itself become slightly dyed without ill effects on the newly hatched maggots. Other aniline dyes have not been tested, but may act similarly, especially if a little alcohol be added.

LESTER (H. M. O.). **Report of the Tsetse Investigation.**—*Rep. med. hlth Serv. Nigeria 1932* pp. 87–95. Lagos, 1933. [Recd. March 1934.]

The author records an outbreak of trypanosomiasis (caused solely by *Trypanosoma vivax*) in a herd of cattle in a locality in Nigeria where transmission by *Glossina* could not have occurred. The strain of *T. vivax* was a virulent one, and large numbers of cattle were herded together at a time when biting flies were numerous, so that conditions were favourable for direct transmission. When the uninfected animals were isolated, no further cases of the disease occurred.

The effect of cyclical transmission through *G. tachinoides*, Westw., on an old strain of *T. rhodesiense* was similar to that obtained with *T. brucei* [*cf. R.A.E.*, B **21** 52], the strain becoming almost avirulent. Later work has shown that cyclical transmission may have little effect on more recently isolated strains, the characteristics of which have not been changed by constant syringe passage.

Among mosquitos found by A. W. Taylor breeding in trees in an arid region were six species of *Aëdes*, including *A. aegypti*, L. Development of *Filaria* (*Wuchereria*) *bancrofti* took place readily in *Anopheles gambiae*, Giles (*costalis*, Theo.), 11 infected examples being found among 97 dissected 5–17 days after the infecting feed. Negative results were obtained with *Aëdes aegypti*.

BRUMPT (E.). **L'ixodiné *Amblyomma dissimile* du Venezuela ne présente pas de parthénogenèse facultative.**—*Ann. Parasit. hum. comp.* **12** no. 2 pp. 116–120, 3 figs., 5 refs. Paris, 1st March 1934.

As a result of laboratory rearings of *Amblyomma dissimile*, Koch, originating in various localities in Venezuela, it is concluded that all eggs laid by unfertilised females are sterile and that Bodkin's observations [*R.A.E.*, B **7** 71] must have been made on a race of *A. dissimile* that was accidentally parthogenetic or on another species, such as *A. agamum*, Arag. [**1** 155].

DYER (R. E.). **Effect of Flea Passage on Epidemic Typhus Virus.**—*Publ. Hlth Rep.* **49** no. 7 pp. 224–225. Washington, D.C., 16th February 1934.

In the course of passages of a strain of epidemic typhus through guineapigs, symptoms typical of endemic typhus were shown by one and by a large number of guineapigs sub-inoculated from it. As experiments with fleas were being carried out at the time, it was thought that escaped fleas might have become infected with the epidemic virus and transmitted it to the original guineapig showing endemic symptoms. Experiments were therefore undertaken in which uninfected rat fleas (*Xenopsylla cheopis*, Roths.) that had fed on rats infected with the same strain of epidemic typhus virus were crushed and inoculated, after a suitable incubation period, into male guineapigs.

Although the virus was passed through fleas three times in this manner, no evidence of change in the virus was observed in the inoculated or sub-inoculated animals.

Screw Worm.—*Insect Pest Surv. Bull.* **13** no. 10 p. 339, multigraph. Washington, D.C., U.S. Dep. Agric., Bur. Ent. [1934.]

Numerous and severe cases of myiasis caused by *Cochliomyia macellaria*, F. [but *cf. R.A.E.*, B **22** 45] were recorded for the first time in the south-eastern United States when horses, cattle, dogs, deer, sheep, goats, cats and even man were attacked in northern Florida and southern Georgia late in 1933. In southern Mississippi the chief injury was to sheep. Outbreaks from Florida to Texas were closely associated with excess rainfall and high temperatures during August and early September.

Ahmad (Taskhir). **Chemotropic Response of Chironomid Fly** (*Forcipomyia* **sp.) to Petroleum Oils.**—*Nature* **133** no. 3360 pp. 462–463, 9 refs. London, 24th March 1934.

In the course of studies on the chemotropic responses of insects at Lyallpur, Punjab, a Ceratopogonid of the genus *Forcipomyia* was attracted in especially large numbers to traps containing petroleum oils. Petrol, which contains hydrocarbons with low boiling points, was least attractive, and this observation was confirmed by an experiment with fractions of a kerosene oil; the fractions distilling between 158 and 184°C. attracted the largest number of flies, those distilling below 158°C. proved least attractive, and those distilling at above 184°C. gave intermediate results. Contrary to data on chemotropic response in other insects, females were chiefly attracted and constituted 91·2 per cent. of all the individuals captured.

Isaac (P. V.). **Papers on Indian Tabanidae. IX. The Life-history of** *Haematopota roralis*, **Fb.**—*Indian J. vet. Sci.* **2** pt. 3 pp. 278–280, 1 pl., 5 refs. Calcutta, September 1932. [Recd. April 1934.]

Haematopota roralis, F., which attacks cattle, is widely distributed over the plains of India and also occurs in Ceylon and the Malay Archipelago. The eggs are laid in long single-tiered clusters of 40–100 on the leaves of rice or other foliage in rice-fields or other low tracts of ground where there are narrow channels of running water. They hatch in the early morning after 4 days, and the larvae drop into the water below, sink to the bottom, moult once and subsequently burrow into the soil. They apparently feed in nature on any soft-bodied animal, but do not attack each other. In the laboratory, they were kept in clean, damp sand and fed on maggots taken from cow-dung. In the summer, the larval stage lasts about 5–7 weeks. Pupation takes place in rather drier soil but close to the larval habitat, the pupal period lasting about 7–9 days. In the hibernating generation, the larval stage may last for 8 months. Three broods may occur in the year if food is plentiful and climatic conditions are favourable, the adults appearing in April, July–August and October. The flies are most abundant in July–August.

ISAAC (P. V.). **Papers on Indian Tabanidae. X. The Life-history of** *Tabanus speciosus* **Ric.**—*Indian J. vet. Sci.* **3** pt. 2 pp. 182–184, 1 pl., 5 refs. Delhi, June 1933. [Recd. April 1934.]

Although it is not numerous, *Tabanus speciosus*, Ric., occurs all over the Indian plains and attacks livestock. It has 3 generations a year, and its habits are similar to those of other species of the genus [*cf. R.A.E.*, B **14** 8]. The eggs hatch in 5 days. During the summer, when food is plentiful, the larvae complete their growth in 15 weeks, but during the winter the hibernating larvae take 6 months. The pupal period lasts about 18 days. The egg, larva and pupa are briefly described.

DATTA (S. C. A.). **The Etiology of Bursati.**—*Indian J. vet. Sci.* **3** pt. 3 pp. 217–236, 6 pls., 59 refs. Delhi, September 1933. [Recd. April 1934.]

The investigations carried out by the author show that the diseased condition of horses in India commonly known as bursati is a habronemic granuloma, probably due to *Habronema muscae*, involving the skin and internal organs, such as the lungs. Neither the identity of the fly concerned in transmission nor the actual manner in which transmission occurs is known.

SEN (S. K.). **The Vector of Canine Piroplasmosis due to** *Piroplasma gibsoni*.—*Indian J. vet. Sci.* **3** pt. 4 pp. 356–363, 1 pl., 1 graph, 10 refs. Delhi, December 1933. [Recd. April 1934.]

The author describes experiments carried out at Muktesar, United Provinces, in which ticks (*Rhipicephalus sanguineus*, Latr.) reared in the laboratory and fed in the larval stage on two dogs infected with *Piroplasma gibsoni* were allowed in the nymphal stage to bite five healthy ones. Three of these dogs contracted the disease after an incubation period of 28–30 days, but as the number of experiments was small and no special precautions were taken to prevent the dogs contracting a natural infection, the results are not regarded as conclusive [*cf. R.A.E.*, B **15** 16, 204]. Notes are given on the method used in feeding the ticks on dogs, which is an adaptation of that devised by Nieschulz and Wawo-Roentoe [**18** 163].

NEGI (P. S.). **The small red Ant** *Solenopsis geminata* **subsp.** *rufa*, **Jerdon, and its Usefulness to Man.**—*J. Bombay nat. Hist. Soc.* **36** no. 4 pp. 1018–1020, 1 pl., 1 fig. Bombay, 15th December 1933. [Recd. April 1934.]

Solenopsis geminata rufa, Jerd., which is widely distributed in Bihar & Orissa, constructs nests of earth, usually under trees, in fields or at the base of outer walls of houses. During 1928–30, evidence was obtained of the possibility of utilising it against various noxious insects. Furniture and clothing may be freed from bed bugs [*Cimex*] by exposure to the ants in the open near the nests or in a room into which colonies may be brought in baskets or tins [*cf. R.A.E.*, B **21** 75]. Persons sleeping in houses into which the ants have been introduced should stop their ears with cotton-wool to prevent the ants from entering them.

Subramaniam (T. V.). **Vegetable Fish Poisons as Insecticides.**—*Mysore agric. Calendar* 1934 pp. 41, 45. Bangalore, 1934.

A powder made from the dried bark of *Mundulea suberosa* [*cf.* *R.A.E.*, B **21** 208] killed Culicine larvae when dusted on the surface of water in breeding-places in Mysore.

Gater (B. A. R.). **On *Anopheles baezai* n. sp., from the Malay Peninsula.**—*Bull. Raffles Mus.* no. 8 pp. 162–168, 4 pls. Singapore, December 1933. [Recd. April 1934.]

The fourth-instar larva [*cf.* also *R.A.E.*, B **21** 281], pupa and adults of both sexes of *Anopheles baezai*, sp. n., are described from Pulau Langkawi, British Malaya, where the larvae were taken in 1928 in stagnant pools under shade, sometimes just within mangrove swamps, in water containing 250 parts chlorine (expressed as chlorides) per 100,000 parts water. Larvae and adults have since been found in Johore, Singapore and Selangor, where the larvae were collected, respectively, in a tidal swamp containing 1,200 parts chlorine, in water with 330 and 680 parts chlorine and in a tidal drain covered with grass and coconut leaves. There is some epidemiological evidence that this species may be a vector of malaria.

Feng (Lan-Chou) & Hoeppli (R.). **On some Histological Changes caused by Mites.**—*Chinese med. J.* **47** no. 11–12 pp. 1191–1199, 3 pls., 15 refs. Peiping, 1933. [Recd. April 1934.]

After reviewing the literature on the subject of histopathological changes in man and animals due to the attack of mites (other than those causing scabies), the authors describe the results of microscopic examination of those produced in tissue from a gecko, a water beetle, and adults of *Tabanus* sp. and *Anopheles hyrcanus* var. *sinensis*, Wied., all found infested with mites in China.

Hoeppli (R.) & Watt (J. Y. C.). **Experiments on Resistance of Dipterous Larvae in Connection with the Problem of Intestinal and Urinary Myiasis.**—*Chinese med. J.* **47** no. 11–12 pp. 1298–1306, 19 refs. Peiping, 1933. [Recd. April 1934.]

The authors review the literature on intestinal and urinary myiasis in man and describe experiments designed to throw light on the resistance of the larvae of *Chrysomyia megacephala*, F., and *Lucilia sericata*, Mg., to conditions in the internal organs. Larvae of the latter are much less resistant than those of the former and only survived for 3 days in the urinary bladder of a freshly killed pig filled with human urine when kept in an ice-chest and fed daily, whereas those of *C. megacephala* lived for 9 days under similar conditions. *Chrysomyia* larvae lived for 48 hours in urine at room temperature without feeding. When fed for 15 minutes once in every 24 hours, they lived for several days at room temperature in urine changed daily. In the empty intestine of a freshly killed pig, larvae of both species lived for 5–6 days in an ice-chest. The larvae apparently need only small amounts of oxygen, and their resistance as shown by these experiments

and those of other investigators [*cf. R.A.E.*, B **11** 18, 34, etc.] explains how certain fly larvae can live in the urinary and intestinal tracts of man for a considerable time.

FENG (Lan-Chou). **A brief Mosquito Survey in some Parts of Central China.**—*Chinese med. J.* **47** no. 11–12 pp. 1347–1358, 1 pl., 18 refs. Peiping, 1933. [Recd. April 1934.]

Between 10th August and 25th September 1932, a mosquito survey was carried out in representative areas of the Provinces of Hupeh, Kiangsi and Chekiang, central China. Annotated lists are given of the mosquitos obtained, showing their breeding-places and the species with which they were associated. The Anophelines collected were *Anopheles hyrcanus* var. *sinensis*, Wied., *A. minimus*, Theo., *A. lindesayi*, Giles, *A. aitkeni*, James, and *A. maculatus*, Theo., from Kiangsi, the first four from Chekiang, and the first only from Hupeh. So far as can be judged from the limited number of species collected in the present survey, the Oriental Region in China reaches at least as far as 30°N. Lat. [*cf. R.A.E.*, B **17** 165]. The finding of *A. minimus* is of interest, as this species is the most important vector of malaria in South China [**20** 216].

HU (S. M. K.) & YEN (Chia-Hsien). **Studies on the Susceptibility of *Culex pipiens* Linnaeus var. *pallens* Coquillett to experimental Infection with *Wuchereria bancrofti* Cobbold in Shanghai Area.**—*Chinese med. J.* **47** no. 11–12 pp. 1359–1366, 5 refs. Peiping, 1933. [Recd. April 1934.]

HU (S. M. K.) & CHANG (Teh-Ling). **Observations on natural Infection of *Culex pipiens* Linnaeus var. *pallens* Coquillett with *Wuchereria bancrofti* Cobbold in Woosung District, Shanghai, China.**—*T.c.*, pp. 1367–1372, 3 refs.

In the first paper, experiments are described in which 48 out of 88 females of *Culex pipiens* var. *pallens*, Coq., that had fed on a patient harbouring microfilariae of *Filaria* (*Wuchereria*) *bancrofti* were found to contain active infective larvae after an incubation period of 13–32 days, the average number being 3·9 per mosquito. The distribution of the infective larvae at the time of dissection appeared to indicate that after they reach maturity they may migrate into the abdomen as well as into the head and labium. In over half the cases, however, some of the infective larvae were found in the labium or head, from which sites they may make their escape when the mosquito is taking a blood meal. It is evident that mosquitos containing a supply of infective larvae in the thorax and abdomen may be infective for several successive feedings, larvae that escape from the head and labium being replaced by others that migrate from the thorax and abdomen at a later date.

In the second paper are given the results of the dissection of 245 females of *C. pipiens* var. *pallens* collected during June and July from a house in Woosung where persons infected with *F. bancrofti* were living. Of the 42 that contained filarial larvae in various stages of development, 30 harboured larvae in the infective stage. Most of the mosquitos were kept in breeding chambers in the laboratory for more than 12 days before dissection to allow time for the filarial larvae to mature, but the finding of infective larvae in some dissected within

4 days of collection indicates that *F. bancrofti* is able to complete its development in *C. pipiens* var. *pallens* under natural conditions in the Shanghai region.

Rodenwaldt (E.). *Filaria malayi* **im Delta des Serajoe II.**—*Meded. Volksgezondh. Ned.-Ind.* **23** no. 1 pp. 21–43, 2 figs., 6 pls., 3 refs. Batavia, 1934.

In further investigations in the Serajoe Delta, Java [*cf. R.A.E.*, B **21** 191], no larvae of *Mansonia* were found in the course of a minute examination, although the adults of *M. annulifera*, Theo., *M. indiana*, Edw., *M. uniformis*, Theo., and *M. longipalpis*, Wulp (*annulipes*, Wlk.), were attacking man in the villages. When engorged females of *M. annulifera* were caged with glasses containing either *Pistia stratiotes*, other water plants or mud, collected in the delta, larvae appeared in the glasses containing *P. stratiotes* but not in the others. In further experiments, egg-batches of *M. annulifera* and *M. indiana* were found on the lower surface of the leaves, to which the eggs are attached by one end. The larvae attached themselves to the roots, but also swam about. For some unknown reason, those of *M. indiana* died in 6 days and most of those of *M. annulifera* in 10. The 3 females of *M. uniformis* used in the experiment did not reproduce.

The egg and first two larval instars of *M. annulifera* and the egg and first instar of *M. indiana* are described in detail.

One laboratory-bred adult of *Anopheles hyrcanus* var. *sinensis*, Wied., contained fully developed larvae of *Filaria malayi* in its proboscis on the eleventh day after a blood meal on a carrier of microfilariae. Dissections of mosquitos captured on man showed the following percentages of infection : 73·6 in 91 examples of *M. annulifera*, 71·4 in 7 of *M. indiana*, 66·6 in 12 of *M. uniformis*, 88·9 in 18 of *A. hyrcanus* var. *sinensis*, and 0 in 44 of *Culex bitaeniorhynchus*, Giles, 46 of *C. vishnui*, Theo., and 34 of *C. alis*, Theo.

Russell (P. F.) & Santiago (D.). **Flight Range of the** *funestus-minimus* **Subgroup of** *Anopheles* **in the Philippines. First Experiment with stained Mosquitoes.**—*Amer. J. trop. Med.* **14** no. 2 pp. 139–157, 2 figs., 1 map, 35 refs. Baltimore, Md, March 1934.

After briefly reviewing some of the literature on the flight-range of Anophelines, the authors describe an experiment carried out in the Philippines during August 1933. Over 2,000 mosquitos stained with a 2 per cent. aqueous solution of brilliant blue were liberated, and catches were made within a radius of about 2–2½ miles from the point of liberation in traps and in natural daytime resting places. Eight stained mosquitos were recaptured at the following distances from the point of liberation ; 1 female of *Anopheles filipinae*, Mnlg., 1,091 yds. N. ; 3 females of *A. mangyanus*, Banks, 218–546 yds. N., and 1 male 982 yds. S. ; 1 female of *A. minimus* var. *flavirostris*, Ludl., 546 yds. N., and 1 male 546 yds. S. ; and 1 female of *A. tessellatus*, Theo., 1,964 yds. S. There were no natural barriers to flight in any direction for over 3,000 yds. Natural sheltering places were abundant in the areas to the north and south, but not in those to the east and west, where rice-fields predominated. No winds with a velocity of more than 12 miles an hour were recorded during the experiment.

Kemp (H. A.), Moursund (W. H.) & Wright (H. E.). **Relapsing Fever in Texas. II. The Specificity of the Vector,** *Ornithodorus turicata*, **for the Spirochete.**—*Amer. J. trop. Med.* **14** no. 2 pp. 159–162, 3 refs. Baltimore, Md, March 1934. **III. Some Notes on the Biological Characteristics of the Causative Organism.**—*T.c.* pp. 163–179, 2 figs., 18 refs.

In the first paper, experiments are described in which adults and nymphs of *Ornithodorus turicata*, Dug., that had fed on rats heavily infected with *Spirochaeta* (*Borrelia*) *novyi*, *S.* (*B.*) *kochi*, *S.* (*B.*) *duttoni* and *S.* (*B.*) *recurrentis* (*obermeieri*), respectively, failed to transmit relapsing fever to healthy rats 4 and 6 weeks later, and subsequent inoculation proved that the rats were not immune. In parallel experiments, two strains of the spirochaete causing relapsing fever in Texas were transmitted from rat to rat by ticks of this species. Similar results were obtained when ticks that had fed on rats infected with the same spirochaetes were crushed and inoculated intraperitoneally into healthy rats at intervals of one, two and three weeks after the feed. The infection produced by inoculation of the Texas strains was not nearly so severe as that produced by the feeding of infected ticks. Thus the spirochaete of relapsing fever in Texas exhibits a strict adaptation to its host, *O. turicata*, as shown by Brumpt [*R.A.E.*, B **21** 244]. The authors, however, do not consider these results incompatible with those of previous experiments [**21** 240] in which serological and cross-immunity tests indicated that this spirochaete and *S. novyi* were closely related or identical; they suggest that the available strain of the latter has lost its power to develop in the tick after more than 3,000 passages through rats [but *cf.* **22** 62].

Jellison (W. L.). **Rocky Mountain Spotted Fever. The Susceptibility of Mice.**—*Publ. Hlth Rep.* **49** no. 11 pp. 363–367, 3 refs. Washington, D.C., 16th March 1934.

Experiments undertaken in Montana showed that meadow mice (*Microtus pennsylvanicus modestus*) are highly susceptible to infection with Rocky Mountain spotted fever and deer mice (*Peromyscus maniculatus artemisiae*) are also susceptible but in a less degree, whereas house mice (*Mus musculus*) are distinctly resistant. Infected nymphs of *Dermacentor venustus*, Banks (*andersoni*, Stiles) transmitted the disease to healthy meadow mice, and larval ticks of the same species subsequently became infected from them. It thus appears possible that both meadow and deer mice may be factors in the natural maintenance and spread of the disease. They are most likely to be so in those parts of the United States where *D. variabilis*, Say, is prevalent, as they are apparently more important as hosts of the larvae and nymphs of this tick than of those of *D. venustus*.

Philip (C. B.) & Jellison (W. L.). **The American Dog Tick,** *Dermacentor variabilis*, **as a Host of** *Bacterium tularense*.—*Publ. Hlth Rep.* **49** no. 12 pp. 386–392, 10 refs. Washington, D.C., 23rd March 1934.

In view of the fact that *Dermacentor variabilis*, Say (American dog tick) is widely distributed and attacks man in those regions of North America where tularaemia occurs and that it has been found naturally infected with *Bacterium tularense* in Minnesota [*R.A.E.*, B **20** 9],

transmission experiments were undertaken at Hamilton, Montana. Infection was produced by feeding and by inoculation of nymphs and adults reared from larvae fed on an infected animal, and by injecting eggs from infected adults. A white-footed mouse (*Peromyscus maniculatus artemisiae*) on which the offspring of ticks infected as adults had fed as larvae was shown by sub-inoculation to have been infected. Some of these larvae and nymphs reared from others were shown by injection to contain virulent organisms, which in some instances apparently caused the death of the ticks *in situ*. Demonstrable infection was not produced in all the host animals in the various experiments. It appears that *B. tularense* is not entirely adapted to continued survival through the developmental cycle of ticks, since the ticks themselves sometimes die (apparently as a result of the presence of the bacterium) while still attached to the host animal and occasionally without infecting it.

Davis (G. E.) & Parker (R. R.). **Comparative Experiments on Spotted Fever and Boutonneuse Fever.**—*Publ. Hlth Rep.* **49** no. 13 pp. 423–428, 2 charts, 8 refs. Washington, D.C., 30th March 1934.

The following is substantially the authors' summary: Rocky Mountain spotted fever vaccine that afforded complete protection against the virus of Rocky Mountain spotted fever in guineapigs showed no protection against the virus of Marseilles (boutonneuse) fever [*cf. R.A.E.*, B **20** 243; **21** 189]. It thus seems probable that Marseilles fever is less closely related to Rocky Mountain spotted fever than is São Paulo "typhus" [**21** 262, etc.].

Read, jr. (H. C.). **The Cockroach as a possible Carrier of Tuberculosis.**—*Amer. Rev. Tuberc.* **28** no. 2 pp. 267–272. Baltimore, Md, 1933. (Abstr. in *Exp. Sta. Rec.* **70** no. 4 p. 528. Washington, D.C., April 1934.)

The experiments described indicate that cockroaches are possible mechanical carriers of tuberculosis. The bacilli were found in all smears of the intestinal tract of cockroaches that had fed on tuberculous sputum, and when recovered, they produced typical lesions in guineapigs. Microscopic sections did not reveal their presence in the tissues, thus showing that they remain in the intestinal tract.

Smart (J.). **Notes on the Biology of *Simulium pictipes* Hagen.**—*Canad. Ent.* **66** no. 3 pp. 62–66, 6 figs., 4 refs. Orillia, March 1934.

An account is given of observations in 1932–33 on the biology of *Simulium pictipes*, Hagen, near Ithaca, New York. The egg and first-instar larva are briefly described. There were four generations a year and possibly a fifth, all stages occurring simultaneously from about the beginning of August. Hibernation takes place in the larval stage, and the adults probably emerge and oviposit early in April, as first-instar larvae were found in the second week of that month. Eggs laid in the second half of April were exposed by a gradual fall of the water level and killed by desiccation. This first generation completed its growth in about 6 weeks, oviposition by the young adults beginning

late in May and extending into the first half of June. The oviposition habits of the females are described. Eggs are laid in large masses embedded in a common gelatinous matrix, usually on the stone bottom of streams, or sometimes on aquatic vegetation, at some point where a thin but continuous film of water passes over with considerable rapidity. Under laboratory conditions at 25°C. [77°F.], the eggs hatched in 2½–5 days ; they were not killed when kept frozen in solid ice for 2 days. As the larvae grow, they gradually move into deeper water, pupating in the centre of the stream. In the field the larval stage lasted 4–6 weeks, but in the laboratory this period could be considerably prolonged if the supply of food was restricted. Pupation takes place in a tough boot-shaped cocoon spun on the rocky substratum of the stream. The pupal stage lasted 4½ days at 25°C. Adults of the second generation appeared in July. The feeding habits of the adults are not known, but in the laboratory females were induced to bite the human arm. Probably about a week elapses between pairing and oviposition.

O'Roke (E. C.). **A Malaria-like Disease of Ducks caused by *Leucocytozoon anatis* Wickware.**—*Bull. Sch. For. Univ. Mich.* no. 4, 44 pp., 5 pls., 17 refs. Ann Arbor, Mich., 1934.

An account is given of investigations undertaken during 1930–33 on a disease of ducks caused by *Leucocytozoon anatis* and transmitted by *Simulium venustum*, Say, including experimental work carried out in Michigan and field observations in Michigan and elsewhere in the United States. Much of the information obtained has already been noticed [*R.A.E.*, B **21** 92]. Only the adult flies harbour the parasite, and as they do not live through the winter, at least in northern regions where extensive nesting grounds of wild ducks are found, the wild ducks in unsettled areas must be infected each year from recovered carrier ducks that have made the migratory flight. Infection in domestic ducks is similarly initiated each summer, and it is suggested that ducks acting as carriers should be destroyed. Cross-infection from wild to domestic ducks and conversely from domestic to wild ones often occurs. Simuliids lay their eggs in running water, in which the larvae hatch and develop, so that the possibility of preventing their breeding is remote. All the serious natural outbreaks observed have occurred in the hottest part of July in young ducks from 10 days to 4 weeks old, simultaneously with the appearance of large numbers of flies ; it is therefore recommended that domestic ducks should be hatched early enough to have grown to a considerable size before the flies become prevalent or late enough to avoid the main Simuliid season. The flies attack ducks chiefly on hot, still days, biting any time after the middle of the morning and being particularly active in the early twilight hours on a warm day ; cold weather, wind and rain are unfavourable. They do not as a rule go into dark, cool enclosures, such as a barn or shed, and ducks might be confined in such places during the time of day when the flies are most active. Other measures suggested are rearing ducks in areas free from the fly, screening them from attack, and removing young infected ducks before they become infective to the fly. The asexual cycle of *L. anatis* in the ducks occupies 10 days and the sexual cycle in *S. venustum* not more than 5 days, field evidence indicating that it may take 2 days or less.

Hull (J. B.), Dove (W. E.) & Prince (F. M.). **Seasonal Incidence and Concentrations of Sandfly Larvae,** *Culicoides dovei* **Hall, in Salt Marshes (Ceratopogoninae : Diptera).**—*J. Parasit.* **20** no. 3 pp. 162–172, 7 figs., 1 ref. Baltimore, Md, March 1934.

An account is given of further investigations on the problem of the control of *Culicoides* breeding on the southern Atlantic and Gulf Coast littorals of the United States [*R.A.E.*, B **20** 271].

The following is largely taken from the authors' summary : Larvae from soft, wet soil of shaded areas and from ditches, barriers and depressions in both grass and mangrove swamps were reared and identified as *Culicoides dovei*, Hall [**20** 219] ; in one instance, adults of *C. melleus*, Coq., were caught in association with those of *C. dovei* in cages placed over crab holes. From 1st July to 30th November, concentrations of larvae occur in the shade of trees near the edges of grass marshes at Charleston, South Carolina. As the incidence of larvae decreases in areas shaded by marsh trees, it increases in ditches of grass marshes leading from such areas, showing that the larvae may be carried by drainage. They become concentrated on the wet banks of roads and barriers, in depressions and ditches, and in "blind" ditches of seepage areas of salt marshes by the action of tidal water, which can only seep away gradually from such sites. In ditches in mangrove marshes, the seasonal concentrations of larvae are comparable with those in the ditches of grass marshes, being most abundant in January, February and especially March. Both types of marshes are completely inundated by the unusually high tides of each month. In mangrove marshes, isolation of larvae from soil samples taken within 300 ft. of ditches from January to June showed that approximately 95 per cent. occur within 10 ft. of the edge of the water. The seasonal concentrations of larvae in ditches of different types of marsh suggest that tidal action in good ditches would undoubtedly drive many of the larvae into deep water, and that artificial treatment of such sites as ditch banks where concentrations occur could be carried out as a supplementary measure. Whether tidal action alone would be sufficient to effect practical control is not yet known.

Brannon (C. H.). **Observations on the Blow-fly** *Lucilia sericata* **Meig.**—*J. Parasit.* **20** no. 3 pp. 190–194, 9 refs. Baltimore, Md, March 1934.

This is a report of investigations on *Lucilia sericata*, Mg., carried out in North Carolina in 1931–32.

The following is largely taken from the author's summary : In North Carolina, eggs were laid on meat under natural conditions during every month of the year. They are usually laid beneath the outer edges of the meat, though in a dark room most of them were found on the upper surface. Adults can be kept for an extended period at 10°C. [50°F.]. Oviposition and development of the eggs, larvae and pupae will also take place at this temperature. Eggs were laid on yeast, banana, beef extract agar and ground up blow-fly larvae, as well as on meat, which was preferred in a tainted condition. Larvae fed readily on the endocrine glands of cows ; those fed on thyroid appeared to have a shorter pupal period. Larvae are very sensitive to excess moisture, but full-grown larvae show a remarkable ability to survive immersion for 24 hours in various liquids.

Bradley (G. H.). **A Method for shipping Mosquito Eggs.**—*J. econ. Ent.* **27** no. 1 p. 289. Geneva, N.Y., February 1934.

Newly deposited egg-rafts of *Culex fatigans*, Wied. (*quinquefasciatus*, auct.) were sent from Florida to Washington in cardboard pill-boxes. A layer of absorbent cotton was placed in the bottom of the box and covered with a tight-fitting disk of blotting paper. Another disk of blotting paper was placed in the lid. The box was then partly filled with clear water and the egg-rafts transferred from the oviposition receptacles by means of a wire loop. The free water in the box was pipetted out, a disk of damp gauze placed over the eggs and the cover put on. After this, the box was wrapped in waxed paper and placed in a slightly larger pill-box, which was wrapped in strong paper, sealed and posted in a letter envelope to Washington, where it arrived on the morning of the second day. Upon arrival the eggs were floated out of the box on to water in breeding-jars, where they promptly hatched. Larvae forwarded in bottles of water generally arrived in good condition, but the former method was preferable.

Boyd (M. F.) & Stratman-Thomas (W. K.). **On the Duration of Infectiousness in Anophelines harboring** *Plasmodium vivax*.—*Amer. J. Hyg.* **19** no. 2 pp. 539–540. Baltimore, Md, March 1934.

To determine whether failures to infect man with benign tertian malaria by the bites of Anophelines in which sporozoites of *Plasmodium vivax* were demonstrable could be attributed to a gradual depletion of the sporozoites harboured by the mosquitos as well as to their degeneration, experimental data were analysed according to the time elapsing between the termination of extrinsic incubation and the employment of the mosquitos transmitting infection. During this time, the mosquitos had been kept in cold storage, where they had had access to water, and had been removed at weekly intervals to feed on a rabbit. The proportion of successful infections during the first 10-day period was not so high as that during the second, when only 2 failures were experienced, but thereafter it gradually became lower until after 50 days no positive infections were obtained, despite the presence of sporozoites in the mosquito. Depletion of the supply of sporozoites may be a factor of considerable importance, as a female kept for 50 days had had 7 opportunities of feeding on a rabbit. However, degeneration of the sporozoites undoubtedly occurs, for in recently matured infections they are straight or only slightly curved, whereas in old ones they are mostly curved, either in broad arcs or fish-hook shapes. The slightly inferior results obtained with mosquitos in which the extrinsic incubation had only recently been completed may possibly indicate that the sporozoites had not yet passed from the secretory cells into the gland duct. Thus the presence of demonstrable sporozoites in the salivary glands is not a sure criterion of the infectiousness of a mosquito.

Thompson (R. W.). **Sodium Fluoride as a Control for Cattle Lice.**—*Rep. ent. Soc. Ontario 1932* **63** pp. 54–56, 1 ref. Toronto, 1933. [Recd. March 1934.]

In Ontario between 1927 and 1931, more than 200 cattle of various ages and breeds were successfully treated with sodium fluoride against the lice, *Haematopinus eurysternus*, Nitz., *Linognathus* (*H.*) *vituli*, L.,

and *Bovicola bovis*, L. (*Trichodectes scalaris*, Nitz.) [*cf. R.A.E.*, B **14** 186 ; **21** 34]. No injury resulted when the treatment was applied to a calf 5 days old. Only one thorough application is required. The sodium fluoride, which is cheap and easily obtained, may be applied as a powder, either alone or mixed with equal parts of maize starch, about 1 oz. being sufficient for each animal. For treating dairy breeds with smoother coats, to which the powder adheres with difficulty, it may be dissolved at the rate of 1 oz. to 1 gal. tepid water and applied with a sponge or rag or even an oil can. Whichever method is used, the hair should be parted to allow the poison to reach the hide where the lice are feeding.

LEGENDRE (F.). **Introduction à Madagascar du** *Gambusia holbrooki*.—*Bull. Soc. Path. exot.* **27** no. 3 pp. 291–294, 1 pl. Paris, 1934.

The author describes the introduction and dissemination of *Gambusia holbrooki* in Madagascar [*cf. R.A.E.*, B **18** 146], where it has become established and given excellent results in reducing the numbers of mosquito larvae. In water from which vegetation, particularly of the horizontal type, has been removed, a medium-sized female may devour as many as 150–200 larvae in a day. During the daytime, particularly in sunny spots, the fish congregate at the edges of water surfaces, where Anophelines prefer to oviposit, provided that the vegetation is not too dense. Thus their action may be rendered more effective by removing the vegetation from the edges of waters in which larvae are numerous. The characters by which they may be distinguished from other fish are described, and instructions are given for their transport and rearing.

MATHIS (M.). **Transmission expérimentale de la fièvre jaune par piqûres de stégomyies, à Paris, en janvier, février, mars 1934.**—*C. R. Soc. Biol.* **115** no. 11 pp. 1217–1219, 4 refs. Paris, 1934.

Both the Asibi and the so-called French strain of yellow fever virus were successfully transmitted from infected to healthy monkeys (*Macacus rhesus*) in the laboratory in Paris during the winter by the bites of females of *Aëdes aegypti*, L. (*argenteus*, Poir.) bred in Paris from eggs received by aeroplane from Dakar. Both the monkeys bitten died of the disease. During the period allowed for incubation (20 days for the Asibi and 38 for the French strain), the mosquitos were kept at 26°C. [78·8°F.] and fed on sugar and water or the blood of an immune monkey. Apparently, instead of becoming attenuated [*cf. R.A.E.*, B **18** 198], the strains become more virulent in the invertebrate host.

SCHWETZ (J.). **Comparaison entre l'infection malarienne des indigènes de la forêt équatoriale et de ceux de la savane. Influence de l'altitude.**—*C. R. Soc. Biol.* **115** no. 11 pp. 1226–1228, 2 refs. Paris, 1934.

In the hilly savannah region on the eastern border of the Belgian Congo, the incidence of malaria depends on altitude. Below 4,500 ft. it is similar to that in the villages of the equatorial forest, but above 4,900–5,250 ft. it decreases, and above 5,900 ft. the disease does not occur.

DUKE (H. L.). **Studies on the Factors that may influence the Transmission of the Polymorphic Trypanosomes by Tsetse. VIII. The Effect of Cyclical Passage through** *Glossina*.—*Ann. trop. Med. Parasit.* **28** no. 1 pp. 79–91, 9 refs. Liverpool, 29th March 1934.

The following is taken from the author's conclusion : A single passage through *Glossina morsitans*, Westw., of a strain of *Trypanosoma brucei* that had been maintained for some years by direct inoculation from vertebrate to vertebrate exerted no apparent effect on the power of the strain to develop in *Glossina*. Repeated cyclical passage of strains of *T. brucei*, *T. gambiense* and *T. rhodesiense* through *G. palpalis*, R.-D., did not enhance their power of infecting this species or being transmitted by it, but usually reduced their power to develop in the fly. The evidence presented suggests that the individual vertebrate host may exert an adverse influence on the power of the trypanosome to develop in tsetse ; on removal to a new host, however, even of the same species, either by cyclical or direct transmission, the power may be fully recovered [*cf. R.A.E.*, B **19** 211]. There are indications that in calves the transmissibility of a strain is reduced.

EVANS (A. M.). **On the Differentiation of** *Anopheles maculipennis* **in Great Britain, with special Reference to a Form occurring on the Coast of North Wales.**—*Ann. trop. Med. Parasit.* **28** no. 1 pp. 131–140, 2 figs., 34 refs. Liverpool, 29th March 1934.

The following is the author's summary : The morphological and several biological characters of a form of *Anopheles maculipennis*, Mg., from a coastal locality in North Wales are described and are found to resemble in many respects the Dutch variety *atroparvus*, van Thiel, the chief difference being the more variable shape of the external spine of the male harpago. Previous observations on the bionomics of *A. maculipennis* in different parts of England and the Isle of Man are referred to [*cf. R.A.E.*, B **21** 151 ; etc.]. These records relate largely to low-lying or coastal districts, and in most cases the described hibernation habits suggest that the variety concerned resembles var. *atroparvus* in this respect.

The prevalence in Cheshire of a form of *maculipennis* that hibernates completely is confirmed ; in the characters of the eggs this form also resembles var. *messeae*, Flni.

It is pointed out that the relative importance of the factors influencing the former distribution of malaria in England cannot be estimated until the differential characters of the forms of *maculipennis* prevalent in potentially malarious and other areas have been studied in all aspects. The presence or absence of domestic animals in these regions, now and formerly, should also be taken into consideration.

DUKE (H. L.). **Annual Report of the Human Trypanosomiasis Research Institute (Uganda) for the Year ended 31st December 1933.**—Fol., 11 pp. Entebbe, 1934. Price 1*s*.

Much of the information in this report on the work of the Institute at Entebbe has already been noticed [*R.A.E.*, B **21** 127, 133, 203, 278 ; **22** 45] or will form the subject of future papers. During the year, *Trypanosoma rhodesiense* was transmitted directly from antelope to antelope (reed buck) apparently by means of *Stomoxys*. A situtunga

and a ntalaganya in the same enclosure remained uninfected, although the latter antelope has been shown to be very susceptible to *T. rhodesiense* [*cf.* **21** 204]. In the laboratory, this trypanosome was readily transmitted by *Stomoxys* from monkey to monkey. The study of wild pig as a reservoir of human trypanosomes is to be discontinued, as this animal has been shown to be a very unsatisfactory host [*cf.* **21** 204]. A young hyaena inoculated subcutaneously with the glands of a fly infected with *T. rhodesiense* became infected, and trypanosomes were seen in its blood from time to time, but two months after inoculation it was still apparently healthy.

WHITNALL (A. B. M.). **The Trypanosome Infections of** *Glossina pallidipes* **in the Umfolosi Game Reserve, Zululand. (Final Report.)**—*Onderstepoort J.* **2** no. 1 pp. 7–21, 4 refs. Pretoria, January 1934.

Further dissections of *Glossina pallidipes*, Aust., trapped in the Umfolosi Game Reserve in Zululand, were carried out between October 1932 and June 1933 and the results compared with those obtained between November 1931 and April 1932 [*R.A.E.*, B **21** 107]. The percentage of trypanosome infection appeared to have increased from 3·42 in the first period to 5·14 in the second, and whereas in the former period 3·31 per cent. of the males and 3·46 of the females showed infections, in the latter the respective percentages were 6·87 and 4·45. A comparison between an area where intensive trapping was being carried out and one in which trapping had been abandoned and fly conditions were consequently returning to normal showed a fly density of 1·8 flies per trap per day in the first area and 60·2 in the second, a regularly higher percentage of infection in the latter, and differences in the distribution of the three species of trypanosomes (*Trypanosoma vivax*, *T. congolense* and *T. brucei*). As these variations occurred in localities only about 5 miles apart, they appear to indicate that flies do not pass with any regularity from one focus to another. Proboscis infection in tsetse-fly in Zululand appears to occur throughout the year, but fluctuates in frequency from month to month. In 87 per cent. of the infected flies, the hypopharynx contained trypanosomes, and it is therefore assumed that the majority of the flies were capable of transmitting them. With regard to the effect on the trypanosome infections of the reduction of fly population by trapping, the general results appear to show that as the population becomes less dense the percentage of infected flies increases, the increase occurring in the number of males infected. It is possible that this may be due to the greater attraction of the traps for females, the young females being removed more rapidly than the males, which therefore have a longer period in which to acquire infection. Out of 18 flies examined from an area of low fly density outside the Reserve, 4 were infected, and again more males were infected than females. Three of the flies were infected with *T. congolense* and one with *T. brucei* ; it thus appears that the most pathogenic trypanosomes are being carried far from their source in the Game Reserve.

The author describes an anomaly in the structure of the salivary glands and hypopharynx occurring in 2·8 per cent. of the flies examined and discusses its possible bearing on the transmission of trypanosomes.

During an outbreak of trypanosomiasis of cattle in the winter of 1932, *Stomoxys* was present in large numbers in the locality and persistently attacked cattle, some of which were infected with *T. congolense*

and *T. brucei*. Flies of this genus that fed on a donkey with numerous trypanosomes in its peripheral blood readily became infected. Trypanosomes (*T. congolense*) remained active in the gut of *Stomoxys* for a maximum of 20 hours, and 8 per cent. of the *Stomoxys* interrupted while feeding on a donkey heavily infected with *T. brucei* showed trypanosomes in both gut and proboscis.

BEDFORD (G. A. H.). **South African Ticks. Part I.**—*Onderstepoort J.* **2** no. 1 pp. 49–99, 53 figs., 29 refs. Pretoria, January 1934.

In this paper, which is the first of a series dealing with the ticks of South Africa, the author deals generally with their external anatomy, their classification, the types of life-cycles and the mode of feeding. He gives keys to the adults and nymphs and to the larvae of the South African species of the genus *Argas*, of which he considers *Ornithodorus* to be a synonym, followed by descriptions of various stages of the 10 species and notes on their hosts, distribution, life-cycle and ability to transmit diseases. Keys are also given to the genera of the family IXODIDAE and to the larvae of the South African species, followed by a description of the genus *Nuttalliella* and of its single species *N. namaqua*, Bedf. [*R.A.E.*, B **19** 184], which has characters in common with both the Argasids and Ixodids but is here included in the latter family. A list of works referring to the transmission of diseases by Argasids is appended.

HARRIS (R. H. T. P.) & WHITNALL (A. B. M.). **The Vegetable Diet Theory of** *Glossina pallidipes*.—*Onderstepoort J.* **2** no. 1 pp. 101–111. Pretoria, January 1934.

In view of the statement recently made by A. Davidson that *Glossina pallidipes*, Aust., can feed on the latex of *Euphorbia tirucalli* and *Sarcostemnus viminale*, the authors discuss the digestive anatomy of the fly and describe experiments in Zululand designed to test this theory. Preliminary tests showed that the temperature of the surface of these plants was lower or only slightly higher than that of the surrounding atmosphere, whereas the temperature of the surface of a mammal is generally much higher. As tsetse-flies apparently do not probe a cool object unless acutely hungry, it was found necessary to warm the naturally cool surface of the plants used in the experiments. The results obtained show that the flies are incapable of piercing the plant tissues and, if given an opportunity to feed on latex as it occurs in nature, soon die without reproducing. Moreover, the latex had an undoubtedly toxic effect on those flies that were artificially induced to feed on it through a membrane.

WILKEN-JORDEN (T. J.). **Further Studies on the Colorimetric Method as a rapid Means of Control of Polysulphide Solutions.**—*Onderstepoort J.* **2** no. 1 pp. 231–237, 4 refs. Pretoria, January 1934.

In the course of further studies on the colorimetric method for determining the concentration of calcium polysulphides in solution [*cf. R.A.E.*, B **21** 109], a modification was evolved that gave results sufficiently accurate for all field purposes. The accuracy of the method did not appear to be influenced by the process of dipping or by the atomic ratio of metal to sulphur in the dip analysed. If this finding

is substantiated for a still wider range of dip samples, the main difficulty in the way of the rapid analysis of lime-sulphur dip-washes will have been overcome.

Bedford (G. A. H.) & Wilken-Jorden (T. J.). **The minimum effective Concentration of Lime-sulphur Dips for Sheep Scab Eradication.**—*Onderstepoort J.* **2** no. 1 pp. 239–241, 2 refs. Pretoria, January 1934.

Experiments were carried out at Onderstepoort in 1932 to determine the minimum effective concentration of polysulphide sulphur in lime-sulphur dipping solutions used for the control of sheep scab [*Psoroptes ovis*, Hering]. Badly infested sheep were dipped individually, each animal being kept immersed for two minutes and its head ducked twice. A second dipping was given nine days after the first. In each case the ears were thoroughly hand-treated with a mixture of 2 parts linseed oil to 1 part kerosene. The results showed that lime-sulphur dips used at strengths between 0·9 and 0·3 per cent. polysulphide sulphur may be effective in curing badly infested sheep, but that lower concentrations are unsatisfactory.

Hambrock (H. A.), Wilken-Jorden (T. J.) & Graf (H.). **A Survey of the Behaviour of Lime-sulphur Dips under Field Conditions.**—*Onderstepoort J.* **2** no. 1 pp. 243–266, 8 refs. Pretoria, January 1934.

Analyses of samples of lime-sulphur dips obtained in the course of actual dipping operations undertaken for the control of sheep scab [*Psoroptes ovis*, Hering] in various parts of South Africa showed that they varied considerably, and the authors discuss the various factors that may influence their composition both during their preparation and in the course of their use in the field.

Bedford (G. A. H.) & Wilken-Jorden (T. J.). **The Effect of dosing Aloes to Tick-infected Cattle.**—*Onderstepoort J.* **2** no. 1 pp. 267–269. Pretoria, January 1934.

In experiments to test the belief, common in South Africa, that domestic animals and poultry may be kept free from ticks by giving them a daily ration of aloes, doses of up to 60 gm. daily for 5 days did not cause ticks to leave cattle. No dead ticks were found on the animals. The marked purging that results renders this treatment most undesirable.

Roberts (F. H. S.). **Ticks infesting domesticated Animals in Queensland.**—*Qd agric. J.* **41** pt. 2 pp. 114–123, 3 pls.; also *Pamphl. Anim. Hlth Sta. Yeerongpilly* no. 1, 11 pp., 3 pls. Brisbane, 1st February 1934.

Brief notes are given on the species of ticks that have been recorded from domestic animals in Queensland, preceded by a description of the bionomics, morphology and classification of ticks in general and followed by instructions for their collection. The ticks dealt with include *Argas persicus*, Oken, *Ixodes holocyclus*, Neum., *Rhipicephalus sanguineus*,

Latr., *Boophilus annulatus microplus*, Can. (*australis*, Fuller), *Haemaphysalis bancrofti*, Warb. & Nutt., *H. bispinosa*, Neum., *H. humerosa*, Warb. & Nutt., *Hyalomma aegyptium*, L., *Amblyomma triguttatum*, Koch, and *A. moreliae*, L. Koch.

Legendre (J.). **La longévité chez les larves d'un moustique arboricole.** —*C. R. Acad. Sci. Fr.* **198** no. 13 pp. 1263–1265, 1 ref. Paris, 1934.

Of a number of larvae of *Aëdes geniculatus*, Ol., collected in France in July 1932 from a hole in an elm and placed in a bottle filled with water from the hole diluted with tap-water, one lived for 18 months and another still longer without increasing in size or pupating. During the winter, they were kept at 17–20°C. [62·6–68°F.].

v. Schuckmann (—) & Peus (F.). **Die Stechmückenplage im Rheingau und die Möglichkeiten ihrer Bekämpfung.** [The Mosquito Plague in the Rheingau and the Possibilities of combating it.]—*Z. GesundhTech. Städtehyg.* **26** no. 3 pp. 131–154. Berlin, March 1934.

An account is given of the results of investigations made in connection with the outbreaks of mosquitos that occur in the Rhine districts between Mainz and Bingen. Most of the trouble is due to *Aëdes vexans*, Mg., though *A. caspius*, Pall., *A. sticticus*, Mg., and *Culex* spp., chiefly *C. pipiens*, L., are also involved. The information on *Aëdes* spp., which is given in detail, is similar to that already noticed [*R.A.E.*, B **22** 59], various improvements in drainage being suggested for control. The measures against *Culex* spp. include the use of a spray against the adults hibernating in buildings.

Swellengrebel (N. H.). **7 Jaar ervaring over anophelesbestrijding in Medemblik.** [Seven Years of Experience in Work against *Anopheles* at Medemblik.]—*Ned. Tijdschr. Geneesk.* **78** no. 3 pp. 345–353. Amsterdam, 20th January 1934. [Recd. April 1934.]

This is the text of an address on the anti-mosquito work at Medemblik from 1926 onwards [*R.A.E.*, B **20** 229, etc.]. Anti-larval measures are not considered of much value in reclaimed areas in Holland [*loc. cit.*]. Fly-sprays are useful in houses to which *Anopheles* [*maculipennis*, Mg.] has to fly from a distance. Kerosene containing 0·5 per cent. pyrethrum extract, 0·5 per cent. oil of sassafras and 2 per cent. methyl salicylate is a cheap and effective spray. The pyrethrum extract is made preferably with Japanese flower-heads extracted with petroleum ether.

Torres Cañamares (F.). **Observaciones sobre los *A. maculipennis* y sus razas en Camporredondo (Jaén).** [Observations on *Anopheles maculipennis* and its Races at Camporredondo, Jaén.]—*Med. Países cálidos* **7** no. 2 pp. 53–72, 1 fig., 14 graphs, 15 refs. Madrid, February 1934.

The object of these investigations was to ascertain which race or races of *Anopheles maculipennis*, Mg., occur at this small village, which has very dry, hot summers and is at an altitude of about 1,700 ft. and

about 108 miles from the coast. The water in the neighbourhood is charged with salts, though by no means brackish. The mosquitos were collected in the village itself where stables were attached to the dwellings, at an isolated inhabited mill, and at farm stables at a distance from the dwelling-house.

The maxillary index [*R.A.E.*, B **16** 210] of 316 females captured from June to September was highest (15) in mosquitos in houses in the village, and lowest (14·91) in the stables there. An Anopheline fauna with an index between 14 and 15 is one that Roubaud has classed as generally safe [*loc. cit.*], but in spite of this malaria was very severe.

In material from this locality, Roubaud himself had found a higher index (15·7). This difference may be explained by the view that unusually dry summers decrease the breeding-places and so, by reducing mosquito abundance and competition for food, permit a fall in the maxillary index. The index for the engorged females was 15·1 and for the non-engorged 14·68, indicating that in spite of the adverse weather there had been some slight competition. The minimum number of teeth was 12 and the maximum 19. The maximum difference in a single mosquito was 4, one maxilla having 18 and the other 14.

The average length of the wings was 4·31 mm., and that of the proboscis-sheath (which is believed to be longer in zoophilous races) was 2·17 mm. In both measurements, the average in engorged females was rather higher than in non-engorged ones. There was no predominance of any given colour in the adults. On the basis of the palmate hairs [*cf.* **20** 119], 70 per cent. of the larvae examined were apparently of the short-winged race and 19 per cent. of the long-winged. As regards the tufts of ante-palmate hairs, a comparatively low average of 4·9 hairs was observed, so that the larvae could be classed as the short-winged race (which has less than 8 hairs).

In colour the eggs laid by captured females agreed generally with the brown spotted eggs attributed to var. *atroparvus*, van Thiel [**21** 178]. In the float, the average length was 0·33 of that of the egg, the average number of striae was 14·8, and the intercostal membrane was not striated. The eggs were therefore of the short-winged race.

In the village, the relative abundance of the mosquitos in the animal quarters was not due to the animals (which in summer were nearly always absent by day and sometimes even by night) but to more favourable conditions [*cf.* **20** 18]. In the presence of animals the mosquitos were seen to bite man towards evening, and they also fed on man at night in the open country.

It is concluded that the predominant race at Camporredondo is var. *atroparvus*, though its biology differs from that in Germany and Italy, where its environment is not the same.

Nezitch (E.). **La malaria en Dalmatie.**—*Bull. Off. int. Hyg. publ.* **26** no. 3 pp. 463–473. Paris, March 1934.

Certain districts in Dalmatia are the most malarious in Jugoslavia. *Anopheles maculipennis*, Mg., is numerous and widely distributed and is undoubtedly the chief vector. The disease reached its maximum incidence in the year immediately following the world war, and in 1922 [*R.A.E.*, B **13** 82] a systematic anti-malaria campaign was begun. Malignant tertian malaria [*Plasmodium falciparum*] predominated, but regular anti-malaria and Anopheline control measures have not only reduced the numbers of infected persons but also the number of cases of malignant tertian as compared with benign tertian [*P. vivax*].

The number of malaria cases is small during the winter, but begins to increase about the end of May and reaches its maximum at the end of July or in August ; after a slight decrease at the beginning of September, it reaches a second peak at the end of September or in October and falls during November and December to the low winter level. The first rise is due to relapses caused by climatic and social conditions. Anopheline larvae may occasionally be found in April, but these either die through adverse weather conditions or their development is so retarded that the first-generation adults do not appear until the end of May or even in certain localities until the end of June. At this time the number of relapses and of gametocyte carriers reaches its maximum, the Anophelines become infected and primary cases of malaria appear. In the drought that occurs towards the end of July and in August, most of the Anopheline breeding-places disappear and the few that remain may be suppressed by anti-larval measures. The number of Anophelines and the amount of malaria decrease considerably. With the first autumn rains, new breeding-places are formed and new generations of Anophelines appear. The population remains longer in the fields and vineyards at this time, and an outbreak of malignant tertian occurs that accounts for the autumn rise in the malaria curve.

In rocky regions, the Anophelines breed in the pools that are often the only source of drinking water for man and animals. As these pools are numerous, scattered amongst rocks and difficult of access, and as the population is poor and consequently susceptible to disease, malaria in this type of region is difficult to combat. In the regions traversed by ravines and streams and in marshy lands, Anophelines breed in the flood waters, which cause considerable economic loss ; the population is less poverty-stricken, and control measures are bound up with measures for agricultural improvement.

Anti-larval measures employed include the clearing of vegetation, spraying with oil or dusting with Paris green, and for stagnant waters the use of the larvicidal fish, *Gambusia*, which has become established in Dalmatia [*cf.* **17** 77]. The advantages of oil as compared with Paris green are discussed, the latter being preferred only for pools where cattle drink. The conditions under which fish may be used are described.

RANKOV (M.). **La malaria dans la Serbie du sud.**—*Bull. Off. int. Hyg. publ.* **26** no. 3 pp. 474–489, 4 figs. Paris, March 1934.

Southern Serbia is a region of mountains and wide valleys, of which large parts are marshy owing to the periodic flooding of rivers and streams during the rainy season. Anophelines, particularly *Anopheles maculipennis*, Mg., occur almost everywhere except at great altitudes, being found in the largest numbers in houses near marshes. The information on the habits and seasonal incidence of this species and of *A. superpictus*, Grassi, is similar to that already noticed [*R.A.E.*, B **12** 192 ; **16** 95 ; **17** 219]. *A. maculipennis* reaches its maximum numbers in July and *A. superpictus* in autumn. The latter enters hibernation at the same time as the former, but does not leave its winter quarters until later. It also shelters in stables, where it is not always inactive, although experience has shown that after overwintering it need no longer be considered of much importance in the transmission of malaria. Investigations would appear to show that the Anophelines are zoophilous, and the widespread distribution of the disease is probably due to the fact that cattle are relatively

scarce in the villages and that during the summer they are kept in the fields.

In addition to the administration of quinine, the usual anti-larval measures such as draining and filling are employed. Where these measures cannot be applied, dusting with Paris green (a 1 per cent. mixture with road dust or more rarely ashes) is carried out at intervals of 7–8 days from the beginning of April to the middle or end of October. *Gambusia* is also effective, but the number of localities where it can be utilised is limited. Recent experiments indicate that control in rice-fields may be brought about by the substitution of intermittent irrigation for the continuous irrigation at present in use. In addition to these measures, several larger projects have been undertaken, including the dredging of the River Drina, the draining of the river valley at Skoplje and the raising of the banks of the Vardar to protect the fields from flooding.

In the north of southern Serbia, good results have already been obtained simply by administering quinine, and malaria is no longer a problem of great importance. In the other regions, this measure has reduced the severity of the disease. As a result of anti-larval measures, Anophelines are less abundant. The numbers of *A. superpictus* have in some cases been reduced to a point where it is no longer of importance in transmission, and the numbers of *A. maculipennis* have been reduced by 90 per cent. or more.

Papers noticed by Title only.

Morquer (R.). **Considérations biologiques sur les variations du** *Botrytis cinerea* **et spécialement sur une nouvelle forme** [forma *theobaldiae*] **pathogène pour les Culicides.**—*Bull. Soc. Hist. nat. Toulouse* **65** fasc. 4 pp. 603–617, 29 refs. Toulouse, 1933. [Recd. April 1934.]

da Fonseca (F.). **Sur la fixation des mâles de la tique** *Amblyomma longirostre* **(Koch, 1844) aux piquants du hérisson** *Coendu villosus* **(Cuv.).**—*C. R. Soc. Biol.* **115** no. 12 pp. 1351–1352, 1 ref. Paris, March 1934.

Goetghebuer (M.). **Ceratopogonidae et Chironomidae du Congo Belge** [including *Culicoides nudipennis*, sp. n., and *C. quinquelineatus*, sp. n.].—*Rev. Zool. Bot. afr.* **24** fasc. 2 pp. 129–151, 42 figs.; **25** fasc. 2 pp. 191–205, 21 figs. Brussels, December 1933 & May 1934.

Parrot (L.). **Phlébotomes du Congo Belge. V.** *Phlebotomus dureni* **n. sp.**—*Rev. Zool. Bot. afr.* **24** fasc. 3 pp. 266–268, 2 figs., 5 refs. Brussels, 5th May 1934.

Villeneuve (J.). **A propos de quelques** *Stomoxys* **africains** [*S. luteola*, sp. n.].—*Rev. Zool. Bot. afr.* **24** fasc. 3 pp. 292–293. Brussels, 5th May 1934.

Vigueras (J. Pérez). **On the Ticks of Cuba, with Description of a new Species,** *Amblyomma torrei*, **from** *Cyclura macleayi* **Gray.**—*Psyche* **41** no. 1 pp. 13–18. Boston, Mass., March 1934.

da Costa Lima (A.). **Sobre um novo** *Aëdes* (*Ochlerotatus*) [*rhyacophilus*, sp. n.] **do Brasil.**—*Mem. Inst. Osw. Cruz* **27** no. 4 pp. 403–406, 1 pl. Rio de Janeiro, 1933. [Recd. April 1934.]

Werneck (F. L.). **Sobre duas especies de Anoplura encontradas em ratos sylvestres do Brasil.** [On two Species of Anoplura (*Hoplopleura travessoi*, Werneck, and *H. fonsecai*, sp. n.) on wild Rats in Brazil.]—*Mem. Inst. Osw. Cruz* **27** no. 4 pp. 407–415, 12 figs. Rio de Janeiro, 1933. [Recd. April 1934.]

Bedford (G. A. H.). **Descriptions of new Species of Anoplura parasitic on Antelopes and a Hare.**—*Onderstepoort J.* **2** no. 1 pp. 41–48, 11 figs. Pretoria, January 1934.

Ferris (G. F.). **A Summary of the Sucking Lice (Anoplura).**—*Ent. News* **45** nos. 3–4 pp. 70–74, 85–88. Philadelphia, Pa, March–April 1934.

Davis (G. E.), Philip (C. B.) & Parker (R. R.). **The Isolation** [in Montana] **from the Rocky Mountain Wood Tick** (*Dermacentor andersoni* [*venustus*]) **of Strains of** *Bact. tularense* **of low Virulence for Guinea Pigs and domestic Rabbits.**—*Amer. J. Hyg.* **19** no. 2 pp. 449–456, 1 ref. Baltimore, Md, March 1934.

Davis (A. C.) & Sloop (K. D.). **Notes on some Insects** [chiefly Diptera and Coleoptera] **found in the Burrows of the California Ground Squirrel** [*Citellus beechyi*] **in Orange County, California.**—*Bull. Brooklyn ent. Soc.* **29** no. 2 pp. 79–83, 2 refs. Lancaster, Pa, April 1934.

Matheson (R.). **Notes on** *Psorophora* (*Janthinosoma*) *horridus* **Dyar and Knab** [discussion of status with description of male].—*Proc. ent. Soc. Wash.* **36** no. 2 pp. 41–43, 2 figs., 5 refs. Washington, D.C., February 1934.

Duncan (I. J.) & Dustman (R. B.). **Quantitative Determination of Coumarin in Plant Material.**—*Industr. Engng Chem.* (Anal. Edn.) **6** no. 3 pp. 210–213, 1 fig., 2 refs. Easton, Pa, 15th May 1934.

Patton (W. S.) & Cushing (E. C.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Genera of the Subfamily Calliphorinae based on a comparative Study of the Male and Female Terminalia. The Genus** *Lucilia* **Robineau-Desvoidy** (*sens. lat.*) [Part I].—*Ann. trop. Med. Parasit.* **28** no. 1 pp. 107–121, 7 figs. Liverpool, 29th March 1934. **The Genus** *Chrysomyia* **Robineau-Desvoidy** (*sens. lat.*) [Part I].—*T.c.* pp. 123–130, 4 figs.

Wigglesworth (V. B.) & Gillett (J. D.). **The Function of the Antennae in** *Rhodnius prolixus* **(Hemiptera) and the Mechanism of Orientation to the Host.**—*J. exp. Biol.* **9** no. 2 pp. 120–139, 5 figs., 40 refs. London, April 1934.

Feng (Lan-Chou). **A comparative Study of the Anatomy of** *Microfilaria malayi* **Brug 1927 and** *Microfilaria bancrofti* **Cobbold, 1877.**—*Chinese med. J.* **47** no. 11–12 pp. 1214–1244, 3 pls., 6 figs., 16 refs. Peiping, 1933.

Chitwood (B. G.) & Chitwood (M. B.). **Nematodes parasitic in Philippine Cockroaches** [*Panesthia* spp.].—*Philipp. J. Sci.* **52** (1933) no. 4 pp. 381–393, 3 pls. Manila, 1934.

HAKKI (I.). **Les moustiques de Turquie. Etudes épidémiologique et prophylactique du paludisme.**—*Rev. Méd. Hyg. trop.* **26** no. 1 pp. 25–34. Paris, 1934.

Much of the information contained in this paper on the Anophelines of Turkey and their control has already been noticed [*R.A.E.*, B **19** 180]. *Anopheles maculipennis*, Mg., *A. sacharovi*, Favr (*elutus*, Edw.), *A. superpictus*, Grassi, and *A. claviger*, Mg. (*bifurcatus*, auct.) are considered to be the vectors of malaria. The first three hibernate in warm situations, such as stables and cow-sheds. From the end of January they become more active, and towards the middle of February many contain mature eggs. No infection was observed during the winter in several mosquitos examined; the first infections appeared, according to the region, in April and May and up to the beginning of August, *Plasmodium vivax* being the predominating parasite. The preference of Anophelines for animals rather than man was noted; a group of dwellings was protected by a row of cow-sheds situated between it and a breeding-place after the small breeding-places in the immediate vicinity of the houses had been destroyed.

BACKLUND (H. O.). **Zur Nahrungsfrage der Mallophagen anlässlich einer eigentümlichen Lebensweise von** *Menopon biseriatum* **Piag.** [A Contribution to the Question of the Food of Mallophaga, arising out of a peculiar Instance of Behaviour of *Eomenacanthus stramineus*.]—*Memor. Soc. Fauna Fl. fenn.* **9** (1932–33) pp. 191–193, 7 refs. Helsingfors, 1934.

Eomenacanthus stramineus, Nitzsch (*Menopon biseriatum*, Piag.) has been found in Finland inside the quills of immature fowl feathers that had fallen out and shrivelled up. It is suggested that this Mallophagan, which normally feeds on the unhardened parts of the bases of feathers, had extended its feeding and injured some blood-vessels [*cf. R.A.E.*, B **21** 189].

COLINS (R.) & DRYENSKI (K.). **Beitrag zur Frage der Infektiosität der Mücken während des Winters.** [A Contribution to the Question of the Infectivity of Mosquitos during Winter.]—*Clin. Bulgara* 1933, no. 8, pp. 456–461. (Abstr. in *Arch. Schiffs- u. Tropenhyg.* **38** no. 5 p. 215. Leipzig, May 1934.)

Investigations at Petrich, Bulgaria, showed that the malarial parasite [*Plasmodium vivax*] can survive the winter in the mosquito. The infectiveness of mosquitos in winter was comparatively higher than in summer. Infected examples of *Anopheles maculipennis*, Mg., contained chiefly sporozoites and were therefore capable of infecting man in winter and spring, so that the brief spring epidemic of benign tertian is probably due to this species.

DRYANOWSKI (K.). **Einige Worte über den sog. "Coccidiosis" bei den Mücken und ihren Larven.** [Some Remarks on the so-called Coccidiosis in Mosquitos and their Larvae.]—*Clin. Bulgara*, 1933, no. 7 pp. 401–403. (Abstr. in *Arch. Schiffs- u. Tropenhyg.* **38** no. 5 p. 217. Leipzig, May 1934.)

In view of Manalang's observations [*R.A.E.*, B **18** 209], the author examined preparations of the digestive tract of *Anopheles maculipennis*, Mg., in London for the presence of *Coccidium*, but the results

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were negative. He also failed to find the parasite in larvae of this or other mosquitos fed on infected excreta of rabbits or in the resulting pupae and adults.

Seitz (A.). **Die Fliegen und das menschliche Auge.** [Flies and the Human Eye.]—*Natur u. Volk* **64** no. 4 pp. 129–138, 3 figs. Frankfurt a. M., 1st April 1934.

This is a popular article on ocular myiasis and the transmission of trachoma by flies.

[Buichkov (V. A.).] **Бычков (В. А.). Staphyliniden (Coleoptera) in den Bauen von Nagern als natürliche Feinde der Flöhe.** [Staphylinids (Coleoptera), living in Nests of Rodents, in the Rôle of Natural Enemies of Fleas. (*In Russian.*)]—*Rev. Ent. URSS* **25** no. 1–2 pp. 94–100, 10 figs., 10 refs. Leningrad, 1933. (With a Summary in German.) [Recd. May 1934.]

Kirschenblatt (J.). **Neue und wenig bekannte palaearktische Staphyliniden (Coleoptera). I.** [New and little known Palearctic Staphylinids (Coleoptera). I.]—*T.c.* pp. 101–103.

The new Staphylinids described in the second paper include *Philonthus psyllophagus* and *Quedius citelli*, both of which were taken in Transbaikalia in nests of *Citellus dauricus*.

The first paper deals with laboratory observations. Fleas from nests of ground squirrels [*Citellus*] from south-eastern Russia were readily destroyed by the Staphylinid, *Coprophilus pennifer*, Motsch., which occurred in numbers in the same nests. In Transbaikalia, fleas taken in nests of *Citellus dauricus* and other rodents were preyed upon by *Q. citelli*, *P. psyllophagus*, *P. ustulatus*, Fauv., and several unidentified Aleocharini, all found in nests of *C. dauricus*. The mouth parts of *C. pennifer* are described. The Staphylinid larvae were not predacious, and the flea larvae were not attacked, but an adult beetle could destroy as many as 8 adult fleas daily. In the absence of fleas, the beetles of the larger species preyed on the smaller ones. Consignments from south-eastern Russia of nests of ground squirrels heavily infested with both fleas and Staphylinids contained only a few fleas on arrival in Leningrad, indicating that the fleas were destroyed by the Staphylinids while still in the nests; this is important in view of the suggestion that plague infection can persist in fleas for long periods [*R.A.E.*, B **21** 160; etc.] The absence of infected fleas among those taken in winter in a great number of nests of rodents [**16** 221] may be explained by the activity of the Staphylinids.

Kamalow (N. G.). **Zur Biologie der *Phlebotomus*-Arten Georgiens.** —*Z. Parasitenk.* **6** no. 4 pp. 546–556, 2 figs., 28 refs. Berlin, 5th May 1934.

After a brief note on the literature dealing with the sand-flies of Georgia (Transcaucasia), of which the commonest are *Phlebotomus papatasii*, Scop., *P. caucasicus*, Marz., and *P. kandelakii*, Shchur. [*R.A.E.*, B **22** 15], the author gives details of field and laboratory observations during the past 4 years. Female sand-flies were collected from dwellings and cattle stalls. Adult females lived up to 10 days, the eggs being usually laid on the second and third days in the course of 24 hours. About 50 per cent. died without ovipositing. Oviposition was more active in the first than in the second half of the summer. The average

number of eggs laid was 39 and the maximum (by a female of *P. caucasicus*) 92. When females, many of which contained eggs, were enclosed in a dry vessel, none oviposited until after a filter paper in the vessel had been moistened. The eggs hatched in 6–11 days at 20–28°C. [68–82·4°F.], but at the beginning of October incubation took up to 17 days. Moisture was more necessary to the younger than to the older larvae. In the laboratory, 76 per cent. of the eggs hatched and about 23 per cent. yielded adults. Of *P. kandelakii*, only eggs and first-instar larvae were obtained. The larval stage of *P. papatasii* lasted 24–36 days and that of *P. caucasicus* 20–26, the respective pupal periods being 10–12 and 8–10 days. Many of the larvae were killed by a black mould-fungus. In the laboratory rather more males emerged than females, but the latter predominated in nature. The adults lived 3–10 days and took blood meals on the second day after emergence.

In Tiflis, the sand-flies occurred from early June to early November, and there were two flight peaks, in July and September. Breeding chiefly occurred in dark places in which there was decomposing organic matter. It is probably the fourth-instar larvae that hibernate.

Esaki (T.). **Poison of** *Paederus idae*. [*In Japanese.*]—*Honzo* no. 11 pp. 27–31, 1 fig. Tokyo, June 1933.

The Staphylinid, *Paederus fuscipes*, Curt. (*idae*, Sharp) contains a poison that causes dermatitis when it comes into contact with the skin [*cf. R.A.E.*, B **21** 193; etc.]. This fact was known in Japan, Korea and China as far back as 1590. The literature on it and classical records in China and Japan are reviewed.

Nagahana (M.). **On Bed-bugs in Korea.** [*In Japanese.*]—*J. Chosen nat. Hist. Soc.* no. 17 pp. 6–16, 2 figs. Keijo, Korea, February 1934.

Characters distinguishing *Cimex hemiptera*, F., and *C. lectularius*, L., which are found throughout Korea, are given, and the possible relation of these bugs to diseases is reviewed from the literature.

Negishi (H.). **Statistical Observations on Rats bearing** *Echidnophaga gallinacea* **Westw. in the City of Kobe.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **6** no. 1 pp. 17–33. Tokyo, March 1934.

Echidnophaga gallinacea, Westw., has recently been found on rats in Kobe, but not on fowls. The percentage found infested averaged 7·7 of *Mus* (*Rattus*) *norvegicus* and 5·7 of *M.* (*R.*) *rattus alexandrinus*, but was as high as 57·9 and 50 respectively in one district. The average numbers found on an infested rat were 21 females and 4 males for *M. novegicus*, and 10 females and 1·5 males for *M. r. alexandrinus*. The flea is commonest in summer and autumn on *M. norvegicus* and is scarce in winter.

Edwards (F. W.). **Deutsche limnologische Sunda-Expedition. The Simuliidae (Diptera) of Java and Sumatra.**—*Arch. Hydrobiol.* Suppl. **13** no. 1 pp. 92–138, 1 pl., 54 figs., 18 refs. Stuttgart, 1934.

This revision of the Simuliids of Java and Sumatra includes keys to larvae and descriptions of 9 new species and 2 new varieties.

Walandouw (E. K.). **Over een nieuwe methode om bij het conserveeren van anophelesmuggen de vleugels gespreid te houden.** [A new Method of obtaining Specimens of Anophelines with extended Wings.]—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 9 pp. 544–545, 3 refs. Batavia, 24th April 1934.

The sun's rays concentrated by a magnifying glass on an adult Anopheline in a test-tube causes it to die with its wings and legs extended. Newly emerged individuals do not react so well.

Achar (S. D.) & Srikantiah (G. N.). **A Note on *Babesia motasi*, Wenyon (1926) in Sheep in Mysore State.**—*Indian vet. J.* **10** no. 4 pp. 270–272, 2 pls., 2 charts, 5 refs. Madras, April 1934.

Piroplasma (*Babesia*) *motasi* is recorded for the first time from Mysore State. All the sheep attacked were found to be infested with *Haemaphysalis bispinosa*, Neum.

Sheep Blowflies.—*Agric. Gaz. N.S.W.* **45** pt. 4 pp. 211–212. Sydney, 1st April 1934.

The new calcium arsenite jetting mixture for protecting sheep against blow-flies [*cf. R.A.E.*, B **22** 17] is prepared by boiling 4 lb. white arsenic and 7 oz. sodium hydroxide in 2 gals. water in a petrol tin until the arsenic is apparently dissolved and pouring slowly into it hot milk of lime (4 lb. stone lime slaked in slightly less than 2 gals. hot water). The mixture should be kept boiling quietly for a further 20 minutes and made up to 40 gals. before use. Satisfactory results have been reported both in the preparation and application of this mixture, and it has been found to give sufficient protection to make re-jetting unnecessary for 5–6 weeks. For sheep with a two months' growth of wool on the crutch, the liquid should be applied at a pressure of 100–125 lb. per inch through a $\frac{1}{16}$-inch nozzle held close to the fleece and directed upwards in the crutch. As the poison is in the form of fine insoluble particles suspended in the water, it will settle to the bottom unless a suitable agitator is employed.

Husband (A. D.) & Duguid (J. F.). **The Toxicity to grazing Animals of Grass sprayed with Sodium Arsenite.**—*Rhod. agric. J.* **31** no. 1 pp. 25–39, 10 refs.; also as *Bull. Minist. Agric.* [*S. Rhod.*] no. 910, 15 pp. Salisbury, S. Rhodesia, January 1934. [Recd. May 1934.]

In experiments in Southern Rhodesia on the toxicity of sodium arsenite to cattle [*R.A.E.*, A **22** 381], it was found that the minimum lethal dose was about 30 grains As_2O_3, which is the amount contained in 2·2 pints of ordinary 7-day dipping solution.

Jack (R. W.). **Tsetse Fly and Game.**—*Rhod. agric. J.* **31** no. 4 pp. 259–294, 1 fldg. map, 19 refs.; also as *Bull. Minist. Agric.* [*S. Rhod.*] no. 915, 36 pp., 1 fldg. map, 19 refs. Salisbury, April 1934.

The author discusses at some length the dependence of *Glossina morsitans*, Westw., on game and the possibility of controlling it by the judicious reduction of such animals in selected areas, supporting his

arguments by reference to the work of other investigators in various parts of Africa and to the results already obtained by utilising this measure in Southern Rhodesia [*cf. R.A.E.*, B **21** 28, 184, 222 ; etc.].

BARRETT (R. E.). **Notes on the Epidemiology of Sleeping Sickness with special Reference to Conditions in the West Nile District of Uganda.** —*E. Afr. med. J.* **11** no. 1 pp. 20–28. Nairobi, April 1934.

The transmission of sleeping sickness is essentially dependent on the breadth and degree of contact between man and tsetse-fly. This is not only a question of human and fly densities, but also of numerous factors influencing the activities of man on the one hand and the bionomics of the fly on the other. The author discusses these factors chiefly in the light of the outbreak of sleeping sickness due to *Trypanosoma gambiense* and transmitted by *Glossina palpalis*, R.-D., that occurred in Aringa in the West Nile District of Uganda in 1927, when there was a severe famine. As there are no rivers large enough to maintain hippopotamus or crocodiles, and monitor lizards and ungulate game are scarce in inhabited areas owing to the hunting activities of the population, it would appear that man and the abundant stock constitute an important if not the principal source of food for the fly. The constantly high proportion of females among flies captured during a survey in 1930 suggested a considerable degree of hunger, which could be explained in a densely populated, heavily stocked area, such as Aringa, where the natural food supply is absent, on the assumption that man and stock are available in the narrow fringe of bush lining the banks of streams only during their periodical visits to watering places and crossings. It can easily be realised that, in an area where the contact between man and fly is so intimate, the danger of an epidemic is greater, even though the fly density is low, than in areas where an abundant supply of reptilian blood protects a scattered population from a far greater density of fly. The undoubted relation between periods of famine and outbreaks of the disease is believed by the author to be due, not to the lowered resistance of man, which probably increases the death rate rather than the number of cases, but to the greater activity and range of the population in search of food, which broaden the contact between man and fly, and to the increased destruction of wild animals for food, which induces the fly to feed more intensively on man. During 1928 and 1929, the disease spread in epidemic form, the maximum incidence being attained in August 1929, after which it declined rapidly to an endemic level by the end of the year, the monthly case incidence remaining fairly constant until observations ceased in August 1930. The author gives reasons for considering that the sleeping-sickness campaign instituted in 1928 was not responsible for the sudden decline in the epidemic. On the other hand, the famine definitely subsided after the onset of the rains in April 1929, and consequently the widespread movement of natives over the country-side in search of food ceased, hunting diminished, and the population was more willing to submit to periodic medical examination and treatment. The distribution of the disease in Aringa indicated that cattle were of some importance in influencing its spread, areas heavily stocked being also most heavily infected. Examination of the blood of the animals disproved the theory that they were the reservoir of *T. gambiense*, but it is believed that they were producing a greater degree of contact between man and fly by carrying into the villages infected flies from the streams, as flies were frequently seen

resting on moving cattle and on numerous occasions were found in villages with half a mile or more of relatively open country between them and the nearest infested stream.

CARPENTER (G. D. H.). **Some Notes on the northern Islands of Lake Victoria.**—*J. Anim. Ecol.* **3** no. 1 pp. 91–104, 2 pls., 2 fldg. maps, 15 refs. London, May 1934.

The information contained in the section of this paper dealing with *Glossina palpalis*, R.-D., in Uganda has already been published [*R.A.E.*, B **2** 30 ; **8** 99 ; **11** 119 ; etc.].

VAN HOOF (L.) & HENRARD (C.). **La transmission cyclique de races résistantes de** *Trypanosoma gambiense* **par** *Glossina palpalis* **(Note complémentaire).**—*Ann. Soc. belge Méd. trop.* **14** no. 1 pp. 109–144, 1 diagr., 11 refs. Brussels, 31st March 1934.

Further work was carried out at Leopoldville [*cf. R.A.E.*, B **21** 236] with a view to determining the behaviour of strains of *Trypanosoma gambiense* from various parts of the Belgian Congo in *Glossina palpalis*, R.-D., and in laboratory animals.

The following is taken largely from the authors' summary : The index of transmissibility of the strains (calculated by Duke's method [**17** 40] except that the time allowed for the invasion of the salivary glands was 15 days) ranged from 0 to more than 6, their resistance to tryparsamide from 0·05 gm. to 1 gm. per kg. weight of guineapig, and their virulence, expressed as length of life of the infected guineapig, from 1½ months to more than a year. The virulence and arsenic resistance were unaltered by cyclical transmission ; the resistance of one strain survived unimpaired for three successive cyclical passages. Contrary to previous findings [*loc. cit.*], mechanical transmission of trypanosomes to monkey or guineapig failed to reduce their transmissibility by *Glossina* ; one strain that appeared from examination of flies fed directly on man to be non-transmissible showed a salivary gland index of 6 in flies fed on a sub-inoculated guineapig. In all these experiments, a transmissibility index based on the infections found in the proventriculus from the 10th day onwards was also calculated for each strain. The strain mentioned above, although its salivary gland index was 0, showed a proventricular index of 1·5 ; this latter may thus, in view of the demonstrated transmissibility of the strain, be of value in supplementing the gland index. Laboratory animals were sometimes infected by the bites of flies in which no gut infection was observed ; as this may be due to the fact that the gut may be free from trypanosomes although the salivary glands are infected [*cf.* **21** 278], the authors consider that all salivary glands should be dissected whether the gut is infected or not. External factors that may influence the transmissibility of trypanosomes are discussed ; they include the age of the infection in the vertebrate host, since it appears that chronic infections are less transmissible.

ANDRÉ (M.). **Note sur un Acarien (***Leiodinychus krameri* **G. et R. Can.) parasite des habitations humaines.**—*Bull. Soc. zool. Fr.* **59** no. 2 pp. 112–122, 5 figs., 3 refs. Paris, 12th May 1934.

An account is given of the infestation of a room in a house near Liège by *Leiodinychus krameri*, G. & R. Can. The mites occurred in great numbers in 1932 and 1933, but did not spread to communicating rooms.

LÉPINE (P.) & BILFINGER (F.). **Infection expérimentale du pou par le virus murin du typhus exanthématique.**—*C. R. Acad. Sci.* **198** no. 17 pp. 1553–1555, 1 ref. Paris, 1934.

The transformation of endemic into epidemic typhus by spontaneous adaptation to the human louse [*Pediculus humanus*, L.] has not hitherto been demonstrated [*cf. R.A.E.*, B **20** 145; **21** 280; etc.]. Unpublished studies by the authors show that injection of the endemic (murine) virus into lice *per rectum* produces an infection that is very soon fatal [*cf.* **21** 141]. In an experiment designed to reproduce the conditions under which murine typhus infecting man can give rise to epidemic typhus, lice that fed on monkeys (*Macacus cynomolgus*) inoculated with a strain of murine typhus from Greece did not become infected. When, however, the monkeys were infected by intraperitoneal injection, accompanied by a coelomic injection of calcium phosphate or (preferably) an intravenous injection of dilute Chinese ink and were then exposed to cold during the incubation of the disease, a large proportion of the lice were infected [*cf.* **21** 142]. As a rule, they became infective on the 10th–16th day, and *Rickettsia* appeared in their intestines as early as the 7th day. Detailed study showed that the development of this infection in *P. humanus* did not differ from that of the epidemic virus.

DE BOISSEZON (P.). **Nouvelles expériences sur la biologie de *Culex pipiens* L.**—*Ann. Parasit. hum. comp.* **12** no. 3 pp. 182–192, 9 refs. Paris, 1st May 1934.

In view of Roubaud's conclusion that there are two distinct races of *Culex pipiens*, L., in France [*R.A.E.*, B **21** 266], the author undertook fresh experiments in 1932–33 in case his previous tests [**18** 9, 94, 211], had been accidentally made with examples of the autogenous race only, although some had been taken in a rural area. In preliminary experiments, it was found that the females captured during summer in a country locality could not lay eggs without a blood meal. By supplying the larvae reared from such females with abundant nourishment rich in vegetable proteins (water containing powdered cooked lentils) and maintaining them at a constant temperature of 18–20°C. [64·4–68°F.], the authors succeeded in obtaining between September 1932 and May 1933 several successive generations. Under such conditions, the biology of the adults was completely altered, and throughout the winter they exhibited the general activity normal in summer and an intense capacity for reproduction. No inactive generation was observed and no degeneration of the ovaries or exhaustion. During the autumn, winter and spring, the females, although deprived of all nourishment in the adult stage, oviposited regularly. Thus the conclusions arrived at during the previous investigations as to the effect of temperature and nourishment on the biology of *C. pipiens* are equally applicable to the rural race under consideration. On the other hand, certain differences were observed in the two lots of mosquitos studied. The larvae in the 1932–33 experiments did not appear able to adapt themselves to a diet of powdered, dried blood, whereas those previously fed on this medium regularly gave rise to adults that oviposited without a blood meal. Moreover, the adults captured in nature never oviposited without a blood meal even when they were fed on vegetable substances [*cf.* **18** 9]. Thus the author considers that in the country larval breeding-places, such as temporary pools, holes,

derelict buckets in gardens, etc., containing water and vegetable débris, are poor in nutritive material, and the larvae are unable to obtain the reserves necessary in the female for the maturation of eggs. The females in the country are therefore very aggressive, a blood meal being necessary not only to enable them to oviposit but also to sustain life and activity. The author concludes that two distinct races do not occur, but that *C. pipiens* may adapt itself to different modes of life under varying conditions and thus show variable biological characteristics.

GALLIARD (H.). **Sur quelques phlébotomes d'Amérique du Sud.**—*Ann. Parasit. hum. comp.* **12** no. 3 pp. 196–202, 5 figs., 7 refs. Paris, 1st May 1934.

Descriptions are given of the pharynx, buccal cavity and spermathecae of *Phlebotomus brumpti*, Larr., and *P. tejerae*, Larr., which is considered distinct from *P. atroclavatus*, Knab [*cf. R.A.E.*, B **20** 161].

DIAS (E.). **Estudos sobre o** [Studies on] *Schizotrypanum cruzi*.—*Mem. Inst. Osw. Cruz* **28** no. 1 pp. 1–110, 12 pls., 9 pp. refs. Rio de Janeiro, February 1934.

This thesis records in great detail data obtained in Brazil on the development of *Trypanosoma* (*Schizotrypanum*) *cruzi* in vertebrates and in *Panstrongylus* (*Triatoma*) *megistus*, Burm., and *Cimex lectularius*, L.

Infective forms remained for many days in the anterior part of the mid-gut of examples of *P. megistus* that had been fed on infected vertebrates. In the posterior part, there were still infective forms during the first few days, but later only crithidial forms occurred and vertebrates were not infected. No metacyclic forms (the real infective stage of the developmental cycle) occurred in the mid-gut. The hind-gut contained no infective forms at first, but metacyclic forms occurred after 6–7 days in the nymphs and 10–15 days in the adults.

Of large numbers of *C. lectularius* collected in infected dwellings, none showed natural infection, and when these bugs were infected experimentally, the trypanosome did not develop in them so successfully as in *P. megistus*. No hereditary transmission of infection was observed in them.

The author disagrees with Brumpt's view that *T. cruzi* is an intestinal parasite of insects accidentally transmitted to vertebrates. Its biological characteristics showed it to be well adapted to both vertebrate and invertebrate hosts, and the latter are indispensable for the survival of the metacyclic forms, which are discharged with the excreta of the bugs and are unsuited for development in another insect.

An account is given of experiments on the transmission of *T. cruzi* from *P. megistus* to laboratory animals [*R.A.E.*, B **21** 15].

GUPPY (P. L.). **Observations on Trinidad Larvicidal Fishes.**—*Trop. Agriculture* **11** no. 5 pp. 117–122, 2 pls., 4 refs. Trinidad, May 1934.

After briefly reviewing the literature on the fish of Trinidad, the author describes the situations in which fish that destroy mosquito larvae have been found and suggests measures that might be taken to

ensure their distribution and conservation. In an appendix, notes are given on the morphology and bionomics of the more important species, together with a list showing their distribution.

Ewing (H. E.). **The Identity and Origin of the Sucking Lice of American Monkeys.**—*Proc. helminth. Soc. Wash.* **1** no. 1 p. 21. Washington, D.C., 7th April 1934.

Two monkeys of different genera from the Upper Amazon that died within a few days of each other in 1930 in the National Zoological Park were heavily infested with *Pediculus capitis* (*humanus*) *americanus*, Ewing [*cf. R.A.E.*, B **14** 172]. The lice had probably been acquired from man by one of the monkeys and spread to the other. If living American monkeys can be successfully parasitised by lice from man, other forms of *Pediculus* [*cf. loc. cit.*] found on some of these monkeys may be the descendants of lice acquired many generations ago from the first American Indians to reach tropical America.

McIntosh (A.). **Distribution of *Boophilus annulatus australis* (Fuller) in the United States.**—*Proc. helminth. Soc. Wash.* **1** no. 1 p. 22. Washington, D.C., 7th April 1934.

An examination of male ticks collected in 1931–33 from Florida, Louisiana and Texas showed *Boophilus annulatus microplus*, Can. (*autralis*, Fuller) to be present in 23 counties in Florida. No ticks were received from 4 counties that were also in the area quarantined for tick fever of cattle (piroplasmosis) [*cf. R.A.E.*, B **22** 57]. This same variety was received from 3 counties in Texas. The males from several other counties in Texas and all the specimens from Louisiana were typical *B. annulatus*, Say. The hosts of *microplus* were cattle, horses, deer, goats and dogs in Florida, and cattle and horses in Texas. Ticks of both sexes from deer in Webb County, Texas, were identified as typical *B. annulatus*.

Marlatt (C. L.). **Report of the Chief of the Bureau of Entomology, 1933.**—47 pp. Washington, D.C., U.S. Dep. Agric., 1933.

An account is given of the activities of the United States Bureau of Entomology during the year ending 30th June 1933. The value of the continuous use of traps against eye-gnats [*Hippelates pusio*, Lw.] in California [*cf. R.A.E.*, B **21** 210] was illustrated in April 1932 ; when the traps were removed for one week in the vicinity of a school, the numbers of the gnats increased suddenly and did not return to normal until several weeks after the traps had been replaced. Breeding occurs in light, loose, moist soils that have been freshly cultivated (usually those planted with vegetable or fruit crops) and seldom in ground bearing heavy cover crops or with manures turned under during January–February or July–August. Garbage and excreta are also suitable and should be disposed of quickly and adequately.

Tests showed that the spread of oils used for the control of mosquito larvae was increased by the addition of materials derived from plant products such as cedar, castor, pine or coconut oils, powdered resin or turpentine, but was unaffected or actually decreased by paradichlorobenzene, naphthalene, acetone, caustic soda solution, soap, aniline oil, sodium benzoate, etc. Adults of *Aëdes lateralis*, Mg. (*aldrichi*,

Dyar & Knab) and *A. vexans*, Mg., which breed abundantly in willow flats and poplar ridges along the Columbia River, were shown by means of marked individuals to have flown 4–5 miles and crossed the river within 10 days. Adults aged 104 days have been recaptured.

Investigation in wooded areas in the central and eastern States during the spring and summer showed that certain species of *Culicoides* breed in large numbers in rot-holes of trees, which are often near houses. Experiments indicated that this source of infestation, which may be responsible for much of the annoyance caused by these midges in various parts of the country, may be eliminated by treating the holes with creosote or creosoted pine sap [*cf.* **20** 272]. Good tree surgery would be more satisfactory.

Outbreaks of Simuliids have occurred annually for several years in early spring in the delta region of Mississippi and neighbouring States, animals (particularly mules) frequently being killed. They were effectively protected by a 5 per cent. pine tar oil emulsion, though 2–5 applications were necessary each day when the insects were abundant and persistent in their attack. The emulsion is cheap and easily prepared and, when sprayed or mopped on to the animal, does not cause injury as does the heavy coating of tar and grease commonly used as a repellent in this region. About 1 cc. of a solution of ½ gm. rotenone in 100 cc. benzene is highly efficient in killing cattle grubs [*Hypoderma*] when injected into the opening of each cyst in the backs of cattle.

Investigations on *Dermacentor variabilis*, Say, in Washington, D.C., where many cases of Rocky Mountain spotted fever have occurred with a relatively high mortality, showed that the larvae and nymphs feed chiefly on small rodents [*cf.* **22** 106] and the adults on dogs and various wild animals and less frequently on horses, cattle and goats. Dogs are of chief importance, owing to their close association with man, and they should be treated each week with ground derris powder or the ticks removed by hand every 4 days, to prevent the engorged ones dropping off. The destruction of small rodents near houses, roads and other places frequented by man is important.

WALLACE (F. G.). **Parasites collected from the Moose** *Alces americanus*, **in northern Minnesota.**—*J. Amer. vet. med. Ass.* **84** (N.S. **37**) no. 5 pp. 770–775, 2 figs., 12 refs. Chicago, Ill., May 1934.

The only Arthropod parasite recorded is *Dermacentor albipictus*, Pack., which was found on almost all moose examined in Minnesota during 1931–33. Its biology is briefly reviewed from the literature [*R.A.E.*, B **1** 161].

STEWART (M. A.). **The Therapeutic Behavior of** *Lucilia sericata* **Meig. Larvae in Osteomyelitis Wounds.**—*Science* **79** no. 2055 pp. 459–460, 6 refs. New York, 18th May 1934.

It has been suggested that, although the larvae of French and Chinese strains of *Lucilia sericata*, Mg., will attack normal tissue, the American strain may not [*R.A.E.*, B **21** 249]. In experiments with two American strains, however, myiasis of guineapigs was easily and repeatedly produced in the absence of necrotic tissue, and 7 sterile larvae caged upon the intact healthy epidermis of the author's fore-arm penetrated to a depth of 3 mm. in less than 48 hours. Care should

therefore be exercised in using larvae of this blow-fly for the treatment of osteomyelitis, though larvae placed on wounds prefer necrotic tissue where it is available.

Campbell (F. L.), Sullivan (W. N.) & Jones (H. A.). **Derris in Fly Sprays. Kerosene Extracts of Derris Root as House Fly Sprays—Method and Results of Laboratory Tests of Extracts of Derris and of Cube Roots. Part I.**—*Soap* 1934 pp. 81–83, 85, 87, 103, 105, 107, 5 figs., 11 refs. New York, March 1934.

Tests having shown that substances other than rotenone contained in derris root might be of value as insecticides, experiments were undertaken to determine the relative toxicity of kerosene extracts of various rotenone-bearing plants against the house-fly [*Musca domestica*, L.].

The following is largely taken from the authors' summary: Kerosene extracts of four samples of derris root, three of cubé [*Lonchocarpus nicou*] root and one of haiari [*Lonchocarpus* sp.] stems were tested against house-flies by a modified laboratory method, which is described in detail. All were effective, the extracts of derris being on the whole more toxic than those of cubé and the extract of haiari less so. Though rotenone is not the only toxic component of kerosene extracts of these plant materials, it appears to be an important one. The methoxyl content may, however, be a better chemical index of the insecticidal value of rotenone-bearing plants than the rotenone content.

Ministry of Health. **Report on the Bed-bug.**—*Rep. publ. Hlth med. Subj.* no. 72, 46 pp., 2 pls., 21 pp. refs. London, H.M.S.O., 1934. Price 1*s*.

A summary is given of the present situation regarding the infestation of houses in Britain by *Cimex lectularius*, L., a problem that has recently become acute in consequence of increased activity in dealing with unhealthy areas and insanitary houses. The lines along which future investigations should be directed are indicated. To prevent the transfer of bugs to uninfested premises, experiments were carried out on the fumigation of furniture in removal vans by means of hydrocyanic acid gas, and it is suggested that this procedure may be of value in eradicating the bugs from upholstered furniture and where unsatisfactory tenants are concerned. Means by which bugs may be transported include infested removal vans and timber from demolished houses, which is sold as firewood. Infested houses have recently been successfully fumigated with hydrocyanic acid gas. Two cheap sprays have been found effective, one consisting of 50 gals. kerosene, 2 gals orthodichlorobenzene and 1 gal. methyl salicylate, and the other of 1,000 parts kerosene, 2 parts oil of mirbane (nitrobenzene), 2 parts cresol and 10 parts ground flowers of pyrethrum (the pyrethrum being steeped in the liquid for 24 hours and then filtered out). Means of eliminating from new houses those constructional features that may act as shelters for the bugs are discussed. The results of the chemical examination of 35 proprietary insecticides used against bugs, the Glasgow system of supervising slum clearance re-housing schemes [*R.A.E.*, B **21** 268] and an annotated bibliography are given as appendices.

Davies (W. M.). **The Sheep Blowfly Problem in North Wales.**—*Ann. appl. Biol.* **21** no. 2 pp. 267–282, 20 refs. London, May 1934.

At present, sheep-farming is the predominant feature of agriculture in North Wales. Although the actual loss of sheep by death from blow-fly attack is comparatively small, the loss of time and labour expended in the daily rounding up and examination of flocks is considerable, and in an abnormal year, when 30–40 per cent. of the sheep may be struck, the loss in live weight becomes appreciable. For these reasons, an investigation of the problem of blow-fly infestation was undertaken with a view to discovering a means of control.

The following is largely taken from the author's summary: Early writings indicate that attack by sheep blow-flies was common and well known in the early sixteenth century before the establishment of sheep-farming in North Wales. A survey showed that *Lucilia sericata*, Mg., is the species concerned [*R.A.E.*, B **17** 151]; larvae of *Calliphora erythrocephala*, Mg., were present in two advanced cases only, and then in small numbers. Sheep are attacked from May until October. In seasons regarded as severe, 10–15 per cent. were attacked in upland districts, and 20–25 per cent. in exposed and 35–40 per cent. in wooded lowland districts. The complete absence of parasitism among larvae taken from living sheep was a significant finding of the survey [*cf.* **18** 158]. Such a source of unparasitised larvae is likely to affect the success of the biological control of blow-flies. The egg stage of *L. sericata* lasted 0·36–0·42 days, the larval 2–2·3, the prepupal 3–16 (during the summer), the pupal 15–33, and the pre-oviposition period 15–28. Four generations were recorded. Hibernation normally takes place in the prepupal stage, the larvae entering the soil in late September or October, usually to a depth of 6–12 ins., and returning to within ¼ in. of the surface to pupate from the middle of March onwards, when the soil temperature at a depth of 8 ins. approaches 45°F. and in the upper layers is slightly higher. In treating infested sheep, shepherds usually cut away the wool and "rub out" the larvae, which fall to the ground and are assumed to die of starvation. Laboratory experiments showed that at the temperature of the sheep's body larvae attain the third instar in 24 hours and, although they are then only half-grown, are capable of giving rise to adults despite subsequent starvation. In practice a shepherd would rarely detect infestation much before the larvae were 24 hours old, a fact that explains why 90 per cent. of the larvae collected after being rubbed out gave rise to adults. The present practice should therefore be changed and a larvicide applied before the larvae are removed. Lambs are evidently more susceptible to attack. Observations on the relative susceptibility of six different breeds of sheep and their crosses are discussed. The degree of infestation ranged from a minimum in the Wiltshire breed, which is only rarely attacked, to a maximum in the Southdown, which is frequently subject to heavy infestation.

Macfie (R. A. S.). **Canine Hysteria in Lunds. Reports I–III.**—*Vet. J.* **85** pp. 460–469; *Op. cit.* **86** pp. 104–114, 265–277. London, 1929–30. **Report IV.**—8vo, 14 pp. [? 1934.]

The author describes numerous cases that occurred in the Lunds District in the Pennines from 1929 onwards of a disease of dogs known as canine "hysteria" and gives his reasons for considering that it

is most probably conveyed by the British dog tick, *Ixodes canisuga*, Johnst., which is numerous on sheep-dogs at hill farms because they are kept in kennels where it can multiply. On several farms, measures were undertaken to eliminate ticks from the dogs and their sleeping quarters ; where these were successful, the disease disappeared, and where it reappeared, ticks were subsequently found.

ELTON (C.). **Metazoan Parasites from Mice in the Isle of Lewis, Outer Hebrides.**—*Parasitology* **26** no. 1 pp. 107–111, 10 refs. London, May 1934.

Insects found in association with rodents in Lewis in 1933 included *Ctenophthalmus agyrtes celticus*, J. & R., and *Typhloceras poppei*, Wagn., on *Apodemus hebridensis*, *Ceratophyllus fasciatus*, Bosc, on *Mus* (*Epimys*) *norvegicus* and all three fleas on *M. musculus* or in its nests. The flea-index of the mice, all of which were trapped in the fields, was very low ; four fleas were found on two rats, taken in a warehouse in Stornoway.

ALESSANDRINI (G.). **La malaria nell'Agro Pontino durante il 1933.** —*Conquista d. Terra* 1934, no. 2, reprint 17 pp. Rome, February 1934. [Recd. May 1934.]

During the campaign in 1933 against malaria in the Pontine district round the Via Appia, fly-sprays and sprayers were supplied to the inhabitants for the destruction of mosquitos in dwellings. Anti-larval work included oiling with Carburol, which is cheaper than kerosene and evaporates more slowly, and dusting with a mixture of Paris green and the dust obtained from ichthyolic bituminous schists [*R.A.E.*, B **21** 260].

PUNTONI (V.). **Sullo sviluppo delle larve anofeline nelle acque di fogna.** [On the Development of Anopheline Larvae in Sewage Water.]—*R.C. Accad. naz. Lincei*, Cl. Sci. fis. mat. nat. (6) **19** no. 6 pp. 428–432. Rome, 1934.

In view of the current belief that Anopheline larvae cannot develop in polluted water, the author carried out experiments to ascertain whether irrigation with sewage water could be used as a measure for control. Rome sewage water, of which the composition is stated, was tested on two varieties of *Anopheles maculipennis*, Mg. Contrary to expectations, var. *labranchiae*, Flni., developed as readily and in about the same time (17–18 days in August) in undiluted sewage water as in spring water containing artificial food. In sewage water diluted with 1 or 2 parts spring water, development required a little longer (about 19 and 21 days respectively). In sewage water diluted with 4 parts spring water, some larvae failed to complete their development, and those that produced adults required over 22 days on an average. By adding sewage water to water containing sufficient artificial food, a more speedy development and a larger percentage of adults were obtained, the best mixture being equal parts sewage water and spring water with artificial food. For var. *messeae*, Flni., the best mixture contained 1 part sewage water and 2 parts spring water with artificial food.

It is therefore probable that irrigation with sewage water or its introduction into streams, etc., might increase Anopheline breeding.

Freeborn (S. B.), Regan (W. M.) & Berry (L. J.). **The Effect of Petroleum Oil Fly Sprays on Dairy Cattle.**—*J. econ. Ent.* **27** no. 2 pp. 382–388, 6 refs. Geneva, N.Y., April 1934.

Recent studies on the relation of fly sprays to milk production [*R.A.E.*, B **21** 33] overlook the existence of the pyrexial point [**20** 141] above which a normal cow, even though unsprayed, cannot maintain its normal body temperature. The statement [**21** 33] that the body temperatures of dark-skinned animals rises higher than those of pale ones conflicts with the author's observations, which showed that the pyrexial point of dark (Holstein) cows was an environmental temperature of 80°F. and of light (Jersey) cows 85°F. At 80°F., an extremely light application (20 cc.) of a commercial fly spray made daily for 10 days produced (after the first 24 hours, during which no change occurred) a persistent and morbid rise in body temperature of the Jersey cows of approximately 1°F., with the accompanying milk changes that would have been expected had the environmental temperature been raised about 5°F. The proportion (31·8 per cent.) of the cow's cooling power obtained by the evaporation of moisture from the skin is reduced to 17·16 per cent. by spraying. Hence more heat is produced than can be dissipated, and the consequent rise in body temperature in turn increases metabolism, thus producing more heat. Although an animal with a higher body temperature loses heat more rapidly by radiation, this is outweighed by the great loss in heat dissipation occasioned by spraying with oil.

As the petroleum oil was believed to be the main injurious component in the fly-sprays, an attempt was made to combine pyrethrum extract and pine oil in water emulsions. Although not injurious to the cows, these mixtures were so inefficient that they were modified, the pine oil and pyrethrum extract being combined with a small amount of petroleum oil and emulsified with water to make a stock emulsion capable of further dilution. The formulae for these emulsions were so arranged that they contained the same amount of pyrethrum and pine oil as had been previously used in petroleum-oil carriers. Several sprays containing the same active ingredients but different emulsifying agents were applied immediately after mixing, and again 6 months later. Those containing alkaline emulsifiers showed a slight deterioration in efficiency after 6 months' storage, but those with neutral emulsifiers such as diglycol oleate and triethanolamine oleate did not. These emulsions proved 80 per cent. effective over an 8-hour period and equal or excel the better brands of commercial sprays in repelling flies. The formulae of the two best emulsions are as follows : 84 cc. petroleum oil (unsulphonatable residue 90, viscosity 97), 48 cc. pyrethrum extract (19–1), 48 cc. steam-distilled pine oil (specific gravity 0·9377, B.P. 194–217°C., colour 1 NPA), 16 gm. triethanolamine oleate and 100 cc. water, to be diluted with 4⅓ parts water ; and 50 cc. petroleum oil, 50 cc. pine oil, 50 cc. pyrethrum extract and 28·9 cc. diglycol oleate, to be diluted slowly with 8 parts water, agitating vigorously. The diluted emulsions caused no rise in body temperature, but reduced the amount of water transpired. Animals treated with the diglycol oleate spray transpired only enough water to dissipate 24·63 per cent. of the total heat, as compared with the normal 31·8 per cent. Apparently increased respiration, sweating at localised areas and body radiation can compensate for this at 84°F., but at higher environmental temperatures some rise in body temperature would probably be experienced.

The effect of the oils is never measurable for at least 24 hours, and after cooling by washing with warm water and soap following spraying, the temperature of the animal returns to its original pre-washing point above normal and in the absence of further spraying gradually (in about 10 days) recedes to normal. The possibility of purely mechanical surface action thus appears to be precluded, and the evidence points to a chemical combination with the body tissues as the cause of the conditions resulting from spraying. Moreover, oils with unsulphonatable residues produce these unfavourable reactions in a shorter time and with more intense results, which corroborates the theory that the problem is a chemical one.

Boyd (M. F.). **Observations on Naturally Induced Malaria.**—*Southern med. J.* **27** no. 2 pp. 155–159, 5 refs. Birmingham, Ala., February 1934.

In the course of work on malaria treatment of paretics in Florida, it was found that the extrinsic incubation period in *Anopheles quadrimaculatus*, Say, at 20°C. [68°F.], was about 17 days for *Plasmodium vivax*, 23 days for *P. falciparum* and 35 days for *P. malariae* [*cf. R.A.E.*, B **21** 182].

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Buckley (J. S.), Bunyea (H.) & Cram (E. B.). **Diseases and Parasites of Poultry.**—*Fmrs' Bull. U.S. Dep. Agric.* no. 1652 (revd), 67 pp., 27 figs., 8 refs. Washington, D.C., September 1933. [*Cf. R.A.E.*, B **12** 67; **19** 112.] [Recd. May 1934.]

Imes (M.). **Hog Lice and Hog Mange. Methods of Control and Eradication.**—*Fmrs' Bull. U.S. Dep. Agric.* no. 1085 (revd), 22 pp., 10 figs. Washington, D.C., November 1933. [*Cf. R.A.E.*, B **8** 200; **19** 200.] [Recd. May 1934.]

Shaftesbury (A. D.). **The Siphonaptera (Fleas) of North Carolina, with special Reference to Sex Ratios.**—*J. Mitchell sci. Soc.* **49** no. 2 pp. 247–263, 2 figs., 32 refs. Chapel Hill, N.C., April 1934.

McIntosh (A.). *Haemaphysalis cinnabarina* **Koch, 1844, from the Sharp-tailed Grouse** [in South Dakota].—*Proc. helminth. Soc. Wash.* **1** no. 1 p. 21. Washington, D.C., 7th April 1934.

Fairchild (G. B.). **Notes on** [N. American] **Tabanidae** [including one new name and one new species].—*Occ. Pap. Boston Soc. nat. Hist.* **8** pp. 139–144, 1 pl., 5 refs. Boston, Mass., 1st June 1934.

Boxhall (G. N.), Happold (F. C.) & Lloyd (L.). **Quinanil as a Bactericidal Agent in the Isolation of an Insect Flagellate.**—*Parasitology* **26** no. 1 pp. 44–48, 16 refs. Cambridge, May 1934.

Sharif (M.). **Historical Review and Relationship of the Genera of the Family Ixodidae.**—*Parasitology* **26** no. 1 pp. 49–56, 3 figs., 16 refs. Cambridge, May 1934.

Jobling (B.). **A Revision of the Genus** *Nycteribosca* **Speiser (Diptera Pupipara, Streblidae)** [including 7 new species].—*Parasitology* **26** no. 1 pp. 64–97, 16 figs., 18 refs. Cambridge, May 1934.

Jobling (B.). **A new Species of the Genus** *Nycteribosca* **(Diptera Pupipara, Streblidae).**—*Parasitology* **26** no. 1 pp. 98–99, 1 fig., 1 ref. Cambridge, May 1934.

Rothschild (Miriam). **Three new Species of Fleas from Dutch New Guinea.**—*Parasitology* **26** no. 1 pp. 100–106, 11 figs., 2 refs. Cambridge, May 1934.

Rodenwaldt (E.). **Kaart en determineertabel van de larven der Anophelinen van Ned. Oost-Indië. Derde Druk.** [A Chart and an Identification Table for the Larvae of the Anophelines of the Netherlands East Indies. Third, enlarged Edition.]—9 pp. text with 2 fldg. diagr., 1 fldg. table. Batavia, Dienst der Volksgezondheid, 1933. [Recd. May 1934.]

Sergent (Ed.), Sergent (Et.) & Catanei (A.). **Etude expérimentale de l'instinct du " retour à la pâture " chez les moustiques.**—*Arch. Inst. Pasteur Algérie* **12** no. 1 pp. 1–9, 3 pls., 1 diagr. Algiers, 1934. [*Cf. R.A.E.*, B **22** 19.]

Galliard (H.). **Un nouveau cas de myiase oculaire due à** *Oestrus ovis* **en France** [with further description of first-instar larva].—*Ann. Parasit. hum. comp.* **12** no. 3 pp. 177–181, 2 figs., 26 refs. Paris, 1st May 1934.

Galliard (H.). **Un phlébotome nouveau du Yucatan,** *Phlebotomus almazani* **n. sp.**—*Ann. Parasit. hum. comp.* **12** no. 3 pp. 193–195, 1 fig., 2 refs. Paris, 1st May 1934.

de Castro Monteiro de Barros Netto (M. J.). **Contribuição ao estudo do genero** *Esthiopterum* **(Hexapoda, Mallophaga), com descripção de tres especies novas.**—Thesis, 81 pp., 9 pls., 20 refs. S. Paulo, Fac. Med., 1933. [Recd. June 1934.]

Roesler (R.). **Histologische, physiologische und serologische Untersuchungen über die Verdauung bei der Zeckengattung** *Ixodes* **Latr.** [Histological, Physiological and Serological Investigations on Digestion in the Tick Genus *Ixodes*.]—*Z. Morph. Oekol. Tiere* **28** no. 3 pp. 297–317, 17 figs., 13 refs. Berlin, 20th April 1934.

[Pavlovskiĭ (E. N.) & Stein (A. K.).] **Павловский (Е. Н.) и Штейн (А. К.). Ueber die Wirkung von** *Dermanyssus gallinae* **Redi (Acarina) auf die Haut des Menschen.** [On the Effect of *D. gallinae*, DeG., on the Skin of Man.] [*In Russian.*]—*Rev. Ent. URSS* **25** no. 1–2 pp. 104–106. Leningrad, 1933. (With a Summary in German.) [Recd. May 1934.] [*Cf. R.A.E.*, B **21** 112.]

[Ass (M. Ya.).] **Асс (М. Я.). Anoplura of the Walrus.** [*In Russian.*] —*Trans. Arctic Inst.* **9** pp. 89–105, 13 figs., 13 refs. Leningrad, 1934. (With a Summary in German.)

Cuthbertson (A.). **The Life-history of the Screw-worm Fly** [*Chrysomyia bezziana*, Villen., in Southern Rhodesia].—*Rhod. agric. J.* **31** no. 4 pp. 256–258, 4 pls., 1 ref.; also as *Bull. Minist. Agric. Rhod.* no. 917, 4 pp., 4 pls., 1 ref. Salisbury, April 1934. [*Cf. R.A.E.*, B **20** 224; **22** 85.]

Schwetz (J.), Baumann (H.), Peel (Mlle.) & Belhommet (Mlle). **Sur l'infection paludéenne trouvée chez les indigènes de l'entre Lac Kivu et Lac Edouard (Parc National Albert). Influence de l'altitude.**—*Ann. Soc. belge Méd. trop.* **14** no. 1 pp. 75–90, 1 map Brussels, 31st March 1934. [*Cf. R.A.E.*, B **22** 111.]

CORRADETTI (A.). **Ricerche sulla biologia delle diverse razze di** *Anopheles maculipennis*. [Researches on the Biology of the various Races of *A. maculipennis*.]—*Riv. Malariol.* **13** no. 2 pp. 182–190, 12 refs. Rome, 1934. (With a Summary in English.)

At 23°C. [73·4°F.], the average life-cycle from egg to adult of all the races of *Anopheles maculipennis*, Mg., occurring in Italy, among which the author here includes *A. sacharovi*, Favr (*elutus*, Edw.), varied from 19 to 22 days. Larvae of var. *messeae*, Flni., supported a salinity of 5 per mille, but only var. *labranchiae*, Flni., and var. *atroparvus*, van Thiel, withstood 10 per mille. A salinity of 3 per mille seemed to be less suitable than one of 5 for all three races, but further work is needed [*cf. R.A.E.*, B **16** 177]. The life-cycle of *A. sacharovi* was the same (22 days) in both white and black containers, whereas that of the others was shorter in the former [*cf.* **18** 197]. The dark pigment of larvae bred on a dark background was found to be situated exclusively in the integument, the colour being lighter after a moult. Pigment does not seem to occur in the fat-body [*cf.* **17** 33].

In Italy, fertilisation in the laboratory (stenogamy) had never been obtained. In the author's experiments, where both sexes were of the same race [*cf.* next paper], *atroparvus* alone had spermatozoa in the spermatheca, the proportion of fertilised females being 26·26 per cent. The negative results hitherto obtained were presumably due to the almost exclusive use of mosquitos from Latium, where this variety does not occur.

Engorged females of all races matured their eggs and oviposited at 18 and 35°C. [64·4 and 95°F.]. The numbers of eggs laid and their measurements are tabulated. Only slight variations in a given race were observed in the measurements of the eggs and their floats.

CORRADETTI (A.). **Sul comportamento sessuale dell'***Anopheles maculipennis* **var.** *labranchiae*. [On the Sexual Behaviour of var. *labranchiae*.]—*Riv. Malariol.* **13** no. 2 pp. 191–194, 4 refs. Rome, 1934. (With a Summary in English.)

In laboratory experiments, females of *Anopheles maculipennis* var. *labranchiae*, Flni., from the Pontine marshes were fertilised by males of var. *atroparvus*, van Thiel, from Ferrara. The eggs, which had the characters of *labranchiae*, were fertile. The failure of attempts to fertilise females of *labranchiae* in the laboratory by males of the same variety [see preceding abstract] is therefore attributed to eurygamy being a character of the males [*cf. R.A.E.*, B **22** 138].

CORRADETTI (A.). **Ricerche sperimentali sui caratteri distintivi dell'** *Anopheles elutus*. [Experimental Researches on the Characters distinguishing *A. sacharovi*.]—*Riv. Malariol.* **13** no. 2 pp. 195–200, 18 refs. Rome, 1934. (With a Summary in English.)

In differentiating *Anopheles sacharovi*, Favr (*elutus*, Edw.) from *A. maculipennis*, Mg., the general colour of the body must be disregarded, as it is subject to considerable modification under the influence of larval environment. Furthermore, variation in the egg-floats of both species under experimental conditions was observed.

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Other characters, however, remained constant, and the author does not agree with the view that *A. sacharovi* is a seasonal dimorph of *A. maculipennis*.

De Benedetti (A.). **Sulla permanenza del verde di Parigi alla superficie delle acque stagnanti delarvizzate col metodo De Benedetti.** [On the Persistence of Paris Green on the Surface of stagnant Water treated against Mosquito Larvae by the De Benedetti Method.]—*Riv. Malariol.* **13** no. 2 pp. 211–216. Rome, 1934. (With a Summary in English.)

In work against Anopheline larvae at Milan, Paris green mixed at the rate of 2 per cent. with earth impregnated with oil according to the author's method [*R.A.E.*, B **21** 180] persisted on the surface of stagnant water and retained its larvicidal power for at least 24–25 days. Thus it should only be necessary to treat such water at intervals of 30 days in the absence of rain or strong wind. Determinations of the arsenic present should be made by the Gutzeit method to ascertain the time for repeating the application, and this should, if possible, be supplemented by inspection for larvae.

Escalar (G.). **L'esperimento di Ardea.**—*Riv. Malariol.* **13** no. 2 pp. 217–227. Rome, 1934. (With a Summary in English.)

In 1933, the second year of malaria prophylaxis by means of domestic animals at Ardea, even better results were attained than in 1932 [*R.A.E.*, B **22** 34]. The infection rate fell from 8·94 to 7·5, and there were no cases of local origin. The spleen index fell from 29·72 to 9·56. Before the establishment of the belt of specially constructed pig-sties, to which 7 were added in 1933, Ardea was the most malarious locality in the Roman Campagna. The cost was about £20 for each of the 27 sties.

Roubaud (E.). **Etude du comportement sexuel comme caractère génétique chez l'***Anopheles maculipennis* **(2e note).**—*Bull. Soc. Path. exot.* **27** no. 4 pp. 339–341, 3 refs. Paris, 1934.

In experiments in which 15 males of a strain of *Anopheles maculipennis* var. *labranchiae*, Flni., from Murcia (Spain) were placed in a small cage with 10 females of a strain of var. *atroparvus*, van Thiel, from the coastal marshes of La Vendée, 3 batches of fertile eggs were laid. No progeny was obtained from adults of both sexes reared from them in a confined space. Dissection of 7 of the original females showed that 4 had been fertilised. In a similar experiment in which 10 females of *labranchiae* were confined with 15 males of *atroparvus*, 3 out of 6 females dissected had paired.

Thus the character of eurygamy in *labranchiae* is a Mendelian dominant, whereas in previous experiments [*R.A.E.*, B **21** 122] in which males of *atroparvus* from Normandy were crossed with females of var. *messeae*, Flni., from Holland (typical *A. maculipennis*, Mg., according to van Thiel [**21** 212]), this character in the latter race was recessive. The fact that, although mosquitos of a eurygamic race rarely pair in a confined space, they will do so with members of a different race confirms the results obtained by de Buck, Schoute and Swellengrebel with the two races in Holland [**20** 194], and refutes Corradetti's conclusion that the male of *labranchiae* is unable to fertilise females in a confined space [see p. 137 above].

Tournier (E.). **Le paludisme à Lomé et au Togo en 1932 et 1933.**—*Bull. Soc. Path. exot.* **27** no. 4 pp. 385–396, 2 refs. Paris, 1934.

In the past, little attention appears to have been given to the question of malaria in Togoland. Previous reports have attributed the practical absence of malaria at Lomé in years between severe outbreaks to measures against Anopheline larvae, whereas in reality it is the result of dry years and probably also of other atmospheric conditions, such as the prevalence of winds from the south or south-west, which carry the mosquitos away from the town. Investigations undertaken in 1932 and 1933 show that malaria, particularly the form (malignant tertian) due to infection with *Plasmodium falciparum* (*praecox*), is widely distributed in Togoland, and it seems probable that both at Lomé and in the interior no inhabitant escapes infection, the native population apparently acquiring no immunity. The town of Lomé is situated on a belt of sandy ground with the sea to the south and to the north a lagoon, which appears to become full automatically as soon as the rainfall reaches about 26 inches. Malaria appears when the lagoon becomes full and remains latent when the lagoon is dry. From October 1932 to the end of 1933, measures were undertaken to improve the southern margin of the lagoon, to fill it by dumping town refuse, and to accelerate the rate of flow of the water by drainage ; oiling of the lagoon was carried out every 8 days during July-September. It was not practicable to administer quinine to the entire population, and partial or intermittent treatment reduced the gravity of the disease rather than the number of cases. It is concluded that malaria at Lomé can only be eliminated by preventing the lagoon from becoming full during rainy years.

The Anophelines taken at Lomé were *Anopheles gambiae*, Giles (*costalis*, Theo.), *A. funestus*, Giles, *A. pharoensis*, Theo., *A. coustani*, Lav. (*mauritianus*, Grp.) and *A. nili*, Theo., the last two being found in such small numbers as to be of no significance in the transmission of malaria. From 15th July to 15th October 1933, Anophelines were prevalent in the town. During the dry season from December to April, they were confined to the neighbourhood of the lagoon, where they are found throughout the year, and to two very reduced permanent foci in the native section. Larvae were only found in the town during August–October. Details of the seasonal incidence of the most important species are given. The author considers that *A. pharoensis* may be of importance as a vector, since it was frequently observed during November and December 1932 and January 1933 when the malaria epidemic had subsided very little, although *A. funestus* was rare and *A. gambiae* practically absent.

De Meillon (B.). **Observations on** *Anopheles funestus* **and** *Anopheles gambiae* **in the Transvaal.**—*Publ. S. Afr. Inst. med. Res.* no. 32 pp. 195–248, 5 figs., 7 graphs, 4 maps, 11 refs. Johannesburg, February 1934.

A more detailed account is given of observations and experiments that have already been noticed [*R.A.E.*, B **22** 53]. Experiments in which gravid females of *Anopheles gambiae*, Giles, were confined in cages with dishes containing different concentrations of ammonium hydrate in distilled water indicated that water containing up to 0·1 gm. free nitrogen per 100,000 was not unfavourable for oviposition,

Ghidini (G. M.). **Contributo alla conoscenza dei Culicidi della Libia.** [A Contribution to the Knowledge of the Culicids of Libya.]—*Boll. Soc. ent. ital.* **66** no. 3 pp. 32–34. Genoa, 31st March 1934.

The mosquitos recorded include *Anopheles* sp., *A. sergenti*, Theo., *A. superpictus*, Grassi, *A. hispaniola*, Theo., *A. multicolor*, Camb., and *Aëdes aegypti*, L. The date and place of capture are noted in each case.

Senevet (G.) & Collignon (E.). **Nouveaux gîtes à Anophélines en Algérie.**—*Arch. Inst. Pasteur Algérie* **12** no. 1 pp. 22–25, 1 ref. Algiers, 1934.

During 1933, larvae of *Anopheles marteri*, Sen. & Prun., were found in the coastal, central and southern regions of the Tell in rapidly flowing streams. By June a large number of these streams had dried up, and others had changed in character and become breeding-places of *A. hispaniola*, Theo. The latter species was found in western, central and southern parts of the Tell, usually in association with *A. maculipennis*, Mg., which was, however, less abundant. It appeared early [*R.A.E.*, B **22** 19], and larvae were still found in October.

Collignon (E.). **De l'insuffisance des radiers plats pour la suppression définitive des gîtes à Anophélines.**—*Arch. Inst. Pasteur Algérie* **12** no. 1 pp. 26–28, 2 figs. Algiers, 1934.

The author points out that drains that are adequate to carry away water during the rainy season in Algeria may during the dry season retain sufficient water at the bottom of the invert to permit Anopheline breeding. He suggests that this stagnant water would not accumulate if a small drain were made along the centre of the invert. Where a drain ends in a basin, the small central drain should be continued in the floor of the basin and pass out through the farther wall in order to carry off any water that may collect.

Senevet (G.). **Contribution à l'étude des nymphes d'Anophélinés (4e mémoire).**—*Arch. Inst. Pasteur Algérie* **12** no. 1 pp. 29–76, 13 figs., 27 refs. Algiers, 1934.

In this, the fourth paper of the series [*cf. R.A.E.*, B **21** 17], descriptions are given of the pupae of *Chagasia bathanus*, Dyar, and *Anopheles neomaculipalpus*, Curry, *punctimacula*, D. & K., *kompi*, Edw., *pseudopunctipennis*, Theo., *bellator* var. *cruzi*, D. & K., *albitarsis*, Arrib., *bachmanni*, Petrocchi, *tarsimaculatus* var. *oswaldoi*, Peryassú, *strodei*, Root, and *ardensis*, Theo. A comparison of about 20 pupal skins of *A. barbumbrosus*, Strick. & Chowdh., with a similar number of those of *A. barbirostris*, Wulp, failed to reveal any difference between the two.

A table showing the author's modification of Edwards' classification of the genera, subgenera and groups of Anophelines [**21** 1] is followed by notes on their pupal characters where these are known. A key is given to the pupae of all the species mentioned in this and the preceding papers of the series. A list of the publications referred to and an index to the species of which the pupae have been described are appended.

Parrot (L.). **Notes sur les Phlébotomes. VII. Sur la présence de** *Phlebotomus sergenti* **dans le Tassili des Ajjers (Djanet, Sahara central).**—*Arch. Inst. Pasteur Algérie* **12** no. 1 pp. 77–78, 4 refs. Algiers, 1934. **VIII. Présence de** *Phlebotomus perniciosus* **var.** *tobbi* **Adler et Theodor 1930 en Géorgie (U.R.S.S.).**—*T.c.* pp. 79–82, 2 figs., 6 refs.

In the first paper, a single male of *Phlebotomus sergenti*, Parr., is recorded from Djanet, in the Algerian Sahara about 250 miles to the east of the locality in which it was previously taken [*cf. R.A.E.*, B **19** 11]. It thus appears to be widely distributed in the central Sahara. As the altitude of these two localities is between 3,880 and 3,940 ft. and as *P. sergenti* has been taken in northern Algeria at El Kantara but not at Biskra (altitude 394 ft.), it is concluded that its distribution is related to altitude and the climatic conditions determined by it.

In the second paper, the author redescribes *Phlebotomus perniciosus* var. *tobbi*, Adl., Thdr. & Lourie, from 10 males taken in association with *P. papatasii*, Scop., *P. caucasicus*, Marz., and *P. kandelakii*, Shchur., in Georgia (Transcaucasia), and from characters of the genitalia considers that it should be raised to specific rank.

Best (A. E.). **Chengtu Mosquitoes.**—*J. West China Border Res. Soc.* **4** pp. 115–118. Chengtu, Szechwan [1932].

An account is given of an investigation on malaria in Szechwan, where it is a serious problem, especially in the Chengtu plain. Mosquitos usually become active in the district about the beginning of April and lay their eggs locally, not travelling far unless carried by wind. Numerous larvae, including *Anopheles pattoni*, Chr., and *A. hyrcanus*, Pall., were found in rice-fields ; in spring they occurred in fields within a few yards of a farm-house in which the adults had evidently passed the winter.

Savage (J. de la M.). **Malaria Section.**—*Rep. Assam med. Res. Soc. 1933*, 7 pp., 2 fldg tables. Shillong, November 1933.

In view of the fact that no Anopheline larvae were found in collections of water adjoining certain steam rice mills in Assam, experiments were undertaken in the laboratory in which larvae (chiefly of *Anopheles maculatus*, Theo., and *A. gigas*, Giles) were placed in dishes (9 ins. in diameter) of water dusted with rice bran at the rate of 1–2 gm. to 300 cc. water. The rice bran spread well and formed a thin, uniform scum, which under laboratory conditions remained 60 hours or longer. Of 1,303 larvae in the dusted dishes 494 were dead within 24 hours and 1,246 within 72 hours, whereas in the control dishes out of 275 larvae only 1 and 2 were dead. Death was apparently due to suffocation, as larvae in abnormal postures remained at the bottom of the water before and after death, in contrast to those killed by means of Paris green mixed with bran, which frequently remained at the surface. That the ingestion of bran was a contributory cause of death was suggested by the curved posture and sluggishness of the dying larvae and by the fact that the older ones, which could feed on the larger particles of bran, died first. In dead larvae, particles of bran were present on the palmate and other hairs and the spiracular apparatus, and an iodine test showed carbohydrate particles in the

gut in addition to the normal contents. There were no deaths within 24 hours among 100 larvae placed in the filtrate from 1 gm. rice soaked in 200 cc. water for 24 hours. In the field, sifted or coarse bran was generally a more useful diluent for Paris green than sand, as it was lighter to handle, mixed more readily, could be used with a rotary blower and was more economical. When unsifted bran was dusted on to growing rice at the rate of 48 lb. to the acre, 108 larvae were collected in 90 dips 24 hours after dusting as compared with 252 before. Of 100 larvae in 10 dishes placed at intervals in a field dusted with a 1 per cent. mixture of Paris green and bran, 12 were dead after 6 hours, 85 after 24 and 90 after 48. Test slides placed at intervals showed 6·5–22·5 particles of Paris green per sq. in.

Collections of Anophelines were made in the plains, hills and frontier tracts of Assam during 1933; malaria infections were found in *A. maculatus* (6 out of 1,919), *A. minimus*, Theo. (86 out of 784) and *A. philippinensis*, Ludl. (2 out of 689). *A. maculatus* was experimentally infected with parasites of benign tertian [*Plasmodium vivax*] and malignant tertian [*P. falciparum*] but not with quartan [*P. malariae*]. Gland infections were obtained with both parasites. At Shillong, no hibernation of *A. maculatus* was observed, 359 adults being taken between December and March, many of which were engorged. Anti-larval measures were begun on 27th September 1932 and continued during 1933 from 19th March, and only 41 adults of *A. minimus* were collected (by 8–10 collectors) between January and November 1933, as compared with 1,417 (by 3–4 collectors) during the corresponding period of 1932. In the open-air laboratory, the duration of each stage in the life-history of *A. maculatus* and *A. minimus* was approximately the same and was shortest in July.

Iyengar (M. O. T.). **Anophelines found naturally infected with Malaria Parasites in Travancore.**—*Rec. Malar. Surv. India* **4** no. 1 pp. 61–63, 2 pls., 7 refs. Calcutta, March 1934.

Examination of mosquitos caught in villages in an intensely malarious region of Travancore from February 1932 to September 1933 revealed malaria parasites in *Anopheles jeyporiensis*, James (3 gut infections among 1,988 examples dissected), *A. varuna*, Iyen. (1 gut infection among 59), *A. fluviatilis*, James (1 salivary gland and 4 gut infections among 132) and *A. culicifacies*, Giles (1 gland infection among 984). This is believed to be the first record of infection in the typical form of *A. jeyporiensis*.

Mehta (Dev Raj). **Ratio of Sexes of some Indian Anophelines hatching under controlled Conditions in the Laboratory.**—*Rec. Malar. Surv. India* **4** no. 1 pp. 65–75, 11 charts, 16 refs. Calcutta, March 1934.

The following is largely taken from the author's conclusions and summary: The results of experiments in which larvae of *Anopheles annularis*, Wulp, and *A. subpictus*, Grassi, were fed on dried filaments of *Spirogyra*, pure yeast powder or macerated flies (*Musca* sp.) indicate that neither the quantity nor the nature of the food-supply affected the sex ratio, male and female adults emerging in almost equal numbers, although in some cases the females predominated. The order in which the sexes emerge is variable, and it does not appear to depend on feeding conditions. The proportion of the sexes among adults reared from

larvae of *A. annularis*, *A. subpictus* and *A. culicifacies*, Giles, collected in nature at different seasons was recorded. In *A. culicifacies* and *A. annularis*, which breeds continuously even in cold weather in the plains of the Punjab, the proportion of males was higher in spring, but later the sexes emerged in almost equal numbers. In *A. subpictus*, however, the numbers in the earlier emergences were almost equal, and later the females were more numerous.

VAN ZWIETEN (M.). **Bijdrage tot de kennis van geneesmiddelresistentie van surratrypanosomen.** [A Contribution to the Knowledge of Drug-resistance of Surra Trypanosomes.]—*Tijdschr. Diergeneesk.* **61** no. 7 reprint 7 pp. The Hague, 1934. (With Summaries in English and French.)

In the course of experiments with a drug-resistant strain of *Trypanosoma evansi*, it was found that after mechanical transmission by *Stomoxys calcitrans*, L., there was a marked decrease of resistance. No transmission was obtained with Tabanids.

GNADINGER (C. B.). **Pyrethrum Flowers.**—Demy 8vo, xi + 269 pp., frontis., text ill., 604 refs. Minneapolis, Minn., McLaughlin Gormley King Co., 1933. Price not stated. [Recd. July 1934.]

The information contained in this book on pyrethrum is taken from an extensive literature and from personal investigations of the author. The botanical characteristics of *Chrysanthemum cinerariaefolium* (the only species of importance as a source of the product) are described, and its cultivation on a commercial scale, particularly in Jugoslavia and Japan, is discussed. In addition to chapters on the active principles of pyrethrum, its evaluation by chemical and biological methods and all aspects of its preparation and use as an insecticide, others contain information on factors affecting the quality of the flowers during storage, on methods of adulteration and their detection, and on the possibilities of pyrethrum as a commercial crop in the United States.

[IOFF (I. G.) & TIFLOV (V. E.).] **Иофф (И. Г.) и Тифлов (В. Е.). Materialen zum Studium der Flöhe der U.d.S.S.R. II. Gattungen : *Coptopsylla* J. & R. und *Chaetopsylla* K.** [Materials for the Study of the Fleas of the U.S.S.R. (*In Russian.*)]—*Rev. Microbiol.* **12** no. 4 pp. 303–321, 18 figs., 8 refs. Saratov, 1934. (With a Summary in German.)

The authors recognise four species of *Coptopsylla*, all found on GERBILLINAE : *C. africana*, Wagn., and *C. wassiliewi*, Wagn., from Tunis, and *C. lamellifer*, Wagn., and *C. bairamaliensis*, Wagn., from Russian Central Asia. As they consider that forms of which the females are indistinguishable are not entitled to specific rank, they regard *C. ardua*, J. & R., as a subspecies of *C. lamellifer*, of which they describe three new subspecies. A table shows the characters differentiating the males of all the six forms found in Russian Central Asia.

The distribution and hosts of the palaearctic species of *Chaetopsylla* and the characters differentiating *C. globiceps*, Tasch., *C. trichosa*, Kohaut, *C. homoeus*, Roths., and *C. appropinquans*, Wagn., the four species that occur in the Russian Union, are discussed.

[Popov (P. P.) & Akhundov (I.).] **Попов (П. П.) и Ахундов (И.). Ein Beitrag zur Kenntnis der Aphaniptera in der Republik Aserbaidjan.** [A Contribution to the Knowledge of the Siphonaptera of Azerbaijan. (*In Russian.*)]—*Rev. Microbiol.* **12** no. 4 pp. 323–327, 16 refs. Saratov, 1934. (With a Summary in German.)

A study of the fleas of Azerbaijan is of special importance owing to the proximity of Persia, where persistent foci of plague occur. Details are given of the numbers of each species found in a survey in 1931–32, their hosts and the place and date of capture. They comprise: *Pulex irritans*, L., on man, dogs and cats and once on a mouse (*Mus musculus*); *Ctenocephalides* (*Ctenocephalus*) *felis*, Bch., and *C.* (*C.*) *canis*, Curt., on dogs and cats, and the former once on a hedgehog (*Hemicchinus*); *Xenopsylla cheopis*, Roths., on *Mus* (*Rattus*) *norvegicus*; *Ceratophyllus fasciatus*, Bosc, on *M. norvegicus* and wood mice (*Apodemus sylvaticus*); *Leptopsylla segnis*, Schönh. (*musculi*, Dug.) on *M. norvegicus* and *M. musculus* and once on a hamster (*Cricetulus*); *Amphipsylla schelkovnikovi*, Wagn., on *Cricetulus*; *Mesopsylla lenis*, J. & R., on *Meriones caucasicus*; and *Archaeopsylla erinacei*, Curt., on hedgehogs (*Erinaceus*). Special importance is attached to the finding of *X. cheopis* on rats in Kazakh and Baku. Of the 24 examples of *A. schelkovnikovi*, 3 contained cysts of *Hymenolepis* sp.

Bishopp (F. C.). **Records of Hymenopterous Parasites of Ticks in the United States.**—*Proc. ent. Soc. Wash.* **36** no. 4 pp. 87–88, 3 refs. Washington, D.C., April 1934.

A brief account is given of the hosts and distribution of *Ixodiphagus texanus*, How., and *Hunterellus hookeri*, How. [*cf. R.A.E.*, B **17** 123, etc.]. The only known host of *I. texanus* is *Haemaphysalis leporis-palustris*, Pack., from which it was obtained in Texas in 1907 and 1914 [*cf.* next paper]. In 1931, *Hunterellus hookeri* was found parasitising 4 batches of nymphs of *Rhipicephalus sanguineus*, Latr., from dogs in Florida. It was also recovered from a nymph of *Dermacentor variabilis*, Say, taken in association with several engorged unparasitised nymphs of *Amblyomma americanum*, L., on a cow on Capers Island (South Carolina), where a number of parasitised nymphs of *Dermacentor* had been released.

Gahan (A. B.). **On the Identities of Chalcidoid Tick Parasites (Hymenoptera).**—*Proc. ent. Soc. Wash.* **36** no. 4 pp. 89–97, 1 fig., 25 refs. Washington, D.C., April 1934.

From a comparative study of material in the U.S. National Museum, the author concludes that *Ixodiphagus caucurtei*, de Buysson, is a synonym of *Hunterellus hookeri*, How. [*R.A.E.*, B **22** 71]. A detailed key is given showing the characters distinguishing this species from *I. texanus*, How. Parasites received by the author for identification from R. A. Cooley and stated to have been reared through four generations from the original stock, which was obtained from *Ixodes hexagonus* var. *cookei*, Pack., on woodchuck in Idaho in June 1932 [*loc. cit.*], comprised 11 examples of *H. hookeri* and 9 of *I. texanus*. As all the individuals of a consignment of the original stock proved to be *H. hookeri*, the author concludes that *I. texanus* was probably introduced later by accident, perhaps on one of the rabbits on which the ticks were fed,

particularly as these animals are hosts of *Haemaphysalis leporis-palustris*, Pack., from which it has previously been recorded.

The distribution of *H. hookeri* is given in detail. The records include examples from *Dermacentor nitens*, Neum., in Porto Rico; one said to have been reared from the nest of a magpie in Montana; and examples probably of this species from *Haemaphysalis leachi*, Aud., and *Hyalomma aegyptium impressum*, Koch, in South Africa [*cf.* **18** 163].

Prado (A.). **Notas sobre o carrapato do chão** (*Ornithodoros rostratus*). [Notes on the Ground Tick.]—*Bol. biol.* N.S. **1** no. 2 pp. 54–57, 1 fig. S. Paulo, December 1933. [Recd. June 1934.]

The distribution of *Ornithodorus rostratus*, Arag., in Brazil is reviewed, and notes on its biology are given. The eggs, which are laid on the ground and are sensitive to drought, hatch in 15–20 days. The ticks attack dogs and bare-footed persons, and in the State of Matto Grosso are reported to have killed large numbers of pigs. Measures suggested for control include covering the earthen floors of huts with cement, fumigation with sulphur and dusting with pyrethrum.

Dunn (L. H.). **Attempts to transmit** *Trypanosoma cruzi* **Chagas with Ticks of the Genus** *Ornithodoros*.—*Amer. J. trop. Med.* **14** no. 3 pp. 283–289, 3 refs. Baltimore, Md, May 1934.

In view of the successful infection of *Ornithodorus moubata*, Murr., with *Trypanosoma cruzi* [*R.A.E.*, B **6** 213], attempts were made to transmit this trypanosome from infected to healthy guineapigs by means of *O. talaje*, Guér., and *O. venezuelensis*, Brumpt, the two ticks of the genus found in Panama, where Chagas' disease also occurs. Biting experiments gave negative results with both species, and injection of suspensions of *O. talaje* produced no infection, but 7 guineapigs inoculated with macerated examples of *O. venezuelensis* all became infected after an incubation period of 14–22 days, the trypanosome persisting in this tick for over 6 months.

Dunn (L. H.). **Notes on the Reduviid Bug,** *Eratyrus cuspidatus* **Stål, naturally infected with** *Trypanosoma cruzi* **Chagas found in Panama.**—*Amer. J. trop. Med.* **14** no. 3 pp. 291–292, 3 refs. Baltimore, Md, May 1934.

A single example of *Eratyrus cuspidatus*, Stål, taken in a hospital in Panama was placed on a healthy guineapig on 21st September; 15 days later, *Trypanosoma cruzi* was observed in the peripheral blood of the guineapig. This Triatomid appears to have been previously recorded only from Venezuela, where it was found naturally infected with *T. cruzi*, and from Colombia.

Shannon (R. C.). **The Genus** *Mansonia* **(Culicidae) in the Amazon Valley.**—*Proc. ent. Soc. Wash.* **36** no. 5 pp. 99–110, 2 col. pls., 1 chart, 12 refs. Washington, D.C., May 1934.

Notes are given on 11 species of the genus *Mansonia* collected in the Amazon Region (Brazil and Peru) between the end of March and June 1931, including *Mansonia fasciolata*, Arrib. (from Brazil and Peru), of which *M. venezuelensis*, Theo., is considered a synonym, and *M. flaveola*, Coq. (from Brazil), which is distinguished from *M.*

titillans, Wlk. *M. titillans* was not found. *M. indubitans*, Dyar & Shan., is the commonest and most annoying species in the region, and at Iquitos, Peru, it is the most troublesome mosquito in houses. A key to the American species of the subgenus *Mansonia* is given, and the characters of the male terminalia are discussed.

Mathis (M.) & Baffet (O.). **Développement larvaire du moustique de la fièvre jaune en culture pure d'euglènes.**—*C. R. Soc. Biol.* **116** no. 19 pp. 317–319, 5 refs. Paris, 1934.

In attempts to rear larvae of *Aëdes aegypti*, L. (*argenteus*, Poir.) in various sterile media, complete development was only obtained in a medium to which a pure culture of *Euglena gracilis* had been added. Adults were obtained in 12–16 days, a period 4–8 days longer than that required in non-sterile media.

Russell (P. F.) & Nono (A. M.). **A Mosquito Net for Use in the Philippine Islands. Experimental Studies and Canvass of Materials.** —*Philipp. J. Sci.* **53** no. 2 pp. 107–140, 10 pls., 1 fig., 26 refs. Manila, February 1934.

In the Philippines, where the houses in rural areas are so loosely constructed as to preclude screening, the use of mosquito nets is probably the most important individual measure available to prevent infection with malaria. With a view to the production of a suitable net made of local materials that could be sold cheaply, the authors carried out the observations and experiments that are here described. The diameters of living female mosquitos at their widest point averaged 1·14 mm. for *Anopheles filipinae*, Mnlg., 1·13 mm. for *A. minimus* var. *flavirostris*, Ludl., 1·19 mm. for *A. mangyanus*, Banks, 1·72 mm. for *Culex fatigans*, Wied. (*quinquefasciatus*, auct.) and 1·57 mm. for *Aëdes aegypti*, L.; for dead examples of *Anopheles maculatus*, Theo., it averaged 1·11 mm., and for dead *A. barbirostris*, Wulp, 1·33 mm. A female of *Aëdes* in passing through a net utilises the diagonal of an aperture, and having pushed the head and one foreleg into the hole, hooks the tibia of the protruding leg over a thread and pulls the rest of the body through.

Sinamay netting (a material woven locally from the fibres of *Musa textilis*) having a mesh of about 16 × 20 per linear inch, with fibres averaging 0·328 mm. and apertures averaging 1·18 × 1·215 mm. will keep out all examples of *Anopheles* and *Culex* and most of *Aëdes*. It is a cheap, durable and practical material for making mosquito nets, and although it will not admit so much air as copper wire screening with about the same mesh, it is better than cotton netting in this respect.

Africa (C. M.). **Three Cases of poisonous Insect Bite involving** *Triatoma rubrofasciata*.—*Philipp. J. Sci.* **53** no. 2 pp. 169–176, 1 pl., 4 refs. Manila, February 1934.

The symptoms produced in man by the bite of *Triatoma rubrofasciata*, DeG., in three cases in the Philippines are described. The adult bugs frequently enter houses at night and have been found to contain mammalian blood, but whether they feed regularly on man is not known. A description of this Triatomid is quoted, and its possible rôle as a vector of disease is discussed.

CHRISTOPHERS (Sir S. R.) & MISSIROLI (A.). **Report on Housing and Malaria, being a Summary of what is known about Anophelism in Relation to Housing and Malaria.**—*Quart. Bull. Hlth Org. L.o.N.* **2** pp. 355–482, 4 figs., 17 pp. refs. Geneva, 1933. [Recd. June 1934.]

This is a detailed summary of recent work and ideas on the subject of housing and malaria, indicating the progress that has been made since the last report [*R.A.E.*, B **20** 56] and showing that, although in some respects the position is now less simple, since it is clear that generalisations cannot cover all the widely different circumstances that have to be considered with respect to the behaviour of Anophelines, knowledge on certain points is more precise.

In the first section, the authors deal with influences such as tropisms (reaction to light, colour, sound, etc.), vital processes (feeding, oviposition, etc.), and habits (hibernation, aestivation, etc.) that determine the behaviour of adult Anophelines. In the second and third, they discuss the output and dispersal of Anophelines from their breeding-places, the influences determining their choice of sheltering place, their density in houses and stables, and the composition of the Anopheline population in such shelters (proportion of sexes, new arrivals, etc.). In the fourth section, work on the movements of mosquitos is reviewed. The importance of the house as a place where malaria is transmitted and the relation to malaria infection of the density of Anopheline population, the distance from breeding-places and the mortality rate of Anophelines are discussed in the fifth section, together with the nature of a malaria vector, the effectiveness of various species and varieties in this capacity and the necessity in tropical countries for segregating Europeans from native carriers of the disease. The sixth section comprises an outline of the present position regarding the races of *Anopheles maculipennis*, Mg., in Europe, showing their relation to such questions as Anophelism without malaria, the disappearance of malaria from certain areas, and the prolonged sojourn of Anophelines in houses. The house is dealt with in the last (seventh) section, consideration being given to site, type, construction, screening, etc.

The following points are taken from the authors' summary and conclusions: It is probable that "malaria houses" have obtained their reputation owing to their proximity to Anopheline breeding-places or to human reservoirs of the parasites, or to the fact that they may be specially liable to have inmates whose mode of life favours the contraction of the disease. The theory that a dark, damp, dirty house suffers in proportion to its attractiveness to Anophelines is against the general trend of opinion, owing to the known great mobility of Anophelines under normal conditions, although it is perhaps possible that in northern Europe the construction or character of houses, or the habits of their inmates, favour the aggregation of the partly hibernating females that are the cause of malaria contracted in winter. The killing of adult Anophelines in houses does not appear to be a profitable method of control under ordinary circumstances, although it might be of great importance if partial hibernation occurred to any extent in houses in a particular area. In the tropics, as elsewhere, cattle act as a diverting and diluting factor in malaria transmission, but the formation of zoophilous strains of Anophelines through selection no longer seems likely, the marked features given to "zoophilism" in Europe being due to the occurrence of a variety of *A. maculipennis*

(var. *messeae*, Flni.) that has relatively little tendency to feed on man. The disappearance of malaria from certain areas is probably a complex phenomenon due to various causes; in some places, it appears to have been due to the exclusive occurrence of Anopheline varieties not closely associated with man and unable to maintain the disease under changed conditions that lowered their contact with man still further. It is considered of primary importance that houses in malarious regions should be screened; as improved methods of construction alone are much less effective in excluding insects, they are relatively unimportant. On the other hand, especially in warm climates, houses should be so constructed as to give the maximum amount of comfort when screened.

JONCHÈRE (—·). **Quelques conceptions actuelles sur l'épidémiologie et le traitement du paludisme.**—*Ann. Méd. Pharm. colon.* **32** no. 1 pp. 46–69, 7 refs. Paris, 1934.

Having made the tour of instruction on malaria and its control organised by the Malaria Commission of the League of Nations and studied recent literature on the subject, the author reviews the malaria situation in Jugoslavia and Italy, and discusses the races of *Anopheles maculipennis*, Mg., and their relation to the disease.

SWELLENGREBEL (N. H.). **De splitsing der Anophelessoorten.** [The Division of Species of *Anopheles*.]—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 12 pp. 706–711. Batavia, 5th June 1934.

The author discusses the importance in malaria control of recognising differences in closely allied forms of Anophelines, giving as examples the races of *Anopheles maculipennis*, Mg., and such species as *A. sundaicus*, Rdnw., which transmits malaria, and *A. ludlowi*, Theo., which does not.

WALLACE (R. B.). **Mass Treatment with Atebrin and Plasmochin simplex, 1933.**—*Malayan med. J.* **9** no. 1 pp. 33–37, 4 charts, 1 ref. Singapore, March 1934.

In continuation of previous work [*R.A.E.*, B **21** 280], investigations were carried out on three widely separated estates in Malaya to determine the effect on malaria incidence of the mass treatment of labourers and their dependents with atebrin (5 days intensive course) followed by plasmochin simplex (0·02 gm. daily for 2–5 months). In all cases the malaria and parasite rates fell rapidly after the intensive treatment and remained low as long as the administration of plasmochin continued. On one estate where oiling was carried out on untreated divisions, the rates were lower on the two treated divisions although the breeding-places of *Anopheles maculatus*, Theo., were more abundant and the adults just as numerous as on comparable oiled divisions. The rate steadily increased as soon as the plasmochin treatment was discontinued.

QUAIFE (W. T.). **Further Remarks on the Brushing Method of Oiling.**—*Malayan med. J.* **9** no. 1 pp. 38–43, 3 refs. Singapore, March 1934.

In this paper, a more detailed account than one already noticed [*R.A.E.*, B **20** 121] is given of the method of treating the breeding-places of *Anopheles maculatus*, Theo., in Malaya by applying oil with

a mop and afterwards brushing it over the surface of the water to form a film. The author considers that the agitation of the water caused by the workers walking in the stream or drain and by the brush is an important factor in the larvicidal action in this method.

In the discussion that followed, Dr. W. J. Vickers described a modification of the method that had proved very successful in a large area, in which the oil was applied in a thin line from a sprayer, the mop being used only for small ponds, holes, etc. It was found that enough oil reached the main water channels from well-oiled side streams to obviate their being treated. The amount of oil required was further greatly reduced by using the finest nozzle available and by abandoning work if heavy rain occurred. Dr. R. E. Anderson stated that the brush method of oiling has been successfully adopted on the properties of the F.M.S. Railways. As the mops are made of coconut husks tied to a bamboo stick and the brushes of coconut fibre, the cost of sprayers and repairs to them is eliminated. Although the amount of oil used has been reduced by almost half and surveying has been more strictly carried out, there has been no noticeable increase in larval catches. Dr. B. Barrowman stated that he had experimented for 7 months in a small area with brushing alone, using no oil, and during that time no larvae of *A. maculatus* had been found, but this may have been due to the heavy rainfall during the year. Dr. C. H. Williams reported that where this method had been used against *A. sundaicus*, Rdnw. (*ludlowi*, auct.) it had not proved so successful and spraying had been resumed; he suggested that *A. sundaicus* was probably more resistant than *A. maculatus* to the oils used. Dr. J. W. Scharff found the method inapplicable in the case of broad sandy streams and in steep ravines in which *A. maculatus* bred in the dangerous hill-foot zone of Georgetown. Dr. W. J. Duncan announced a great saving in the amount of oil by using the brush and an ordinary knapsack sprayer with the cock adjusted so that a thin dribble of oil was applied to ordinary drains and isolated drops to smaller drains, whereas seepage areas were sprayed in the usual way without brushing. From periodical surveys and from the health on the estates, he estimated that this method was at least as efficient as ordinary spraying.

Scott (G. W.). **Fascine Drainage in Mosquito Control.**—*Malayan med. J.* **9** no. 1 pp. 65–66, 3 figs. Singapore, March 1934.

In hilly country in Malaya, larvae of *Anopheles maculatus*, Theo., most frequently breed in the smaller drains 9 ins. to 3 ft. wide. As a substitute for oiling, the author suggests that such drains, after being cleaned, should be filled to a height 6 ins. above the normal water level with round sticks laid lengthwise. These should be covered with a layer of lalang grass that, when dried and matted down with storm water, is sufficiently thick to prevent the access of mosquitos to the water in the drain. The lalang should be laid like thatch, beginning at the outfall and placing the cut ends upstream. Such drains last about 6 months in average showery weather; the lalang then begins to slip down between the sticks and to show holes, and the drain becomes silted up so that the water tends to come to the surface. Relaying is simple, however, and many of the sticks can be used again. Such a method is not suitable for treating main channels of ravines, which have to carry large quantities of storm water, but it has recently

been modified by covering the lalang with a layer of earth ; this leaves a channel to carry off storm water while normal seepage runs between the sticks.

Galli-Valerio (G.). **Observations sur les Culicidés, les Tabanidés et les Simulidés.**—*Zbl. Bakt.* (1 Orig.) **131** no. 7–8 pp. 487–490, 1 ref. Jena, 1st June 1934.

This is a record of observations on the seasonal occurrence in Switzerland from October 1931 to October 1933 of mosquitos, Tabanids and *Simulium gallii*, Edw.

Hinman (E. H.). **Predators of the Culicidae (Mosquitoes). I. The Predators of Larvae and Pupae exclusive of Fish.**—*J. trop. Med. Hyg.* **37** no. 9 pp. 129–134. **II. Predators of Adult Mosquitoes.** —*T.c.* no. 10 pp. 145–150, 3 pp. refs. London, 1st & 15th May 1934.

From a review of the literature on the predacious enemies of Culicids and from his own observations, the author concludes that they are not likely to be of value in the biological control of adult mosquitos. Of species (other than fish) that prey on the larvae, only the aquatic Rhynchota and Coleoptera are thought to be worth serious consideration, and their frequent association with their prey indicates that their utilisation would probably be limited to artificial containers or small collections of water.

Corson (J. F.). **A further Note on a Strain of** *Trypanosoma brucei* **from Zululand.**—*J. trop. Med. Hyg.* **37** no. 10 pp. 152–153, 1 ref. London, 15th May 1934.

The following is largely taken from the author's summary : A strain of *Trypanosoma brucei* from Zululand, causing a mild infection in white rats and failing, in the earlier passages, to infect about half the rats inoculated, produced in one rat an infection that remained latent for about 9 months. This appeared to result in a selection in this rat of virulent trypanosomes, because subinoculated rats died in 13–19 days as compared with 60–200 or more in previous inoculations. As it has been suggested that cyclical passage through *Glossina* modifies polymorphic trypanosomes by stabilising their virulence or removing acquired qualities, examples of *G. morsitans*, Westw., were fed on a guineapig inoculated with the virulent strain. Rats bitten by two of these flies died in 14–25 days, showing that the virulence of the strain was not affected. One of the flies fed on the author, who had twice previously proved susceptible to infection with *Trypanosoma rhodesiense*, but no infection resulted. This finding supports the view that *T. brucei* is unable to infect man.

Kunert (H.) & Krause (M.). **Findet in** *Glossina morsitans* **eine zyklische Entwicklung des** *Trypanosoma evansi* **statt ?** [Does a Cyclical Development of *T. evansi* occur in *G. morsitans* ?]—*Arch. Schiffs- u. Tropenhyg.* **38** no. 6 pp. 257–259. Leipzig, June 1934.

Experiments are described in which *Trypanosoma evansi* was transmitted mechanically to guineapigs by laboratory-bred adults of

Glossina morsitans, Westw., but attempts to obtain cyclical transmission were unsuccessful. No trypanosomes were found in flies dissected after the experiments were concluded.

Malbrant (R.) & Dugué (J. M.). **Les trypanosomiases animales en Afrique Equatoriale Française.**—*Rec. Méd. vét. exot.* **6** nos. 2–3 pp. 77–101, 121–138, 17 refs. Paris, 1933.

A comprehensive account is given of trypanosomiasis of domestic animals in French Equatorial Africa. The principal vectors, *Glossina morsitans*, Westw., *G. palpalis*, R.-D., and *G. tachinoides*, Westw., are prevalent practically throughout Gabun, Middle Congo and Ubangi, but their distribution in the Chad region is not continuous and is therefore recorded in some detail. Notes are given on the habits of the flies, and possible measures for their control, including clearing, grass-burning, etc., are discussed.

Conference of Governors of British East African Territories. Research Conferences. Conference on Co-ordination of Veterinary Research held at Kabete . . . January 1934.—Med. 8vo, 80 pp. Nairobi, 1934.

This report of a conference of veterinary research workers from Uganda, Tanganyika Territory and Kenya Colony, which was convened primarily to plan a programme for investigations that would prevent overlapping, includes short accounts of the work that has already been carried out in East Africa on diseases of animals, including those transmitted or caused by Arthropods.

Nieschulz (O.) & du Toit (R.). **The Occurrence of *Bdellolarynx uniseriatus* Malloch, a Blood-sucking Fly, in the Transvaal.**—*J. S. Afr. vet. med. Ass.* **4** pp. 221–222, 1 fig., 2 refs. Johannesburg, 1933. [Recd. May 1934.]

Haematobia (*Bdellolarynx*) *uniseriata*, Malloch, is recorded for the first time from the Transvaal, where it appears to be common in certain localities. It attacks horses and mules in relatively large numbers, particularly shortly before and after sunset. The adults of both sexes are briefly described.

Lawrence (D. A.) & Cuthbertson (A.). **Myiasis (Screw-worm) in Cattle in Southern Rhodesia.**—*Rhod. agric. J.* **31** no. 5 pp. 348–355, 2 pls., 2 refs.; also as *Bull. Minist. Agric. Rhod.* no. 921, 8 pp., 2 pls., 1 ref. Salisbury, S. Rhodesia, May 1934.

A more detailed account [*cf. R.A.E.*, B **22** 85] is given of the conditions that predispose cattle to attack by *Chrysomyia bezziana*, Villen., in Southern Rhodesia. Game animals are apparently resistant to infestation, and as the fly requires a living host for its reproduction, there would be little chance of its survival if it were controlled on domestic stock. This resistance of game appears to be due to a natural resistance to disease and debilitating conditions and to a lower incidence of other predisposing injuries. Native cattle are less often infested than European breeds, probably because they are better able to withstand adverse grazing conditions and (owing to the fact that they are kept in kraals and frequently handled) are more docile and

cause less injury to each other when mustered for dipping. Tick infestation is also less severe among them, probably owing to more thoroughly controlled dipping. Conversely, improved breeds of cattle under ranching conditions are most susceptible, especially as the ranches are usually situated in bush country of a type favourable for ticks and for *Chrysomyia*. Moreover, cases of myiasis on ranches are usually treated only when the cattle are dipped, and in the intervals full-grown maggots drop to the ground, so that infestation of the veldt increases progressively.

SEN (S. K.). **The Ox Warble Fly.**—*Agric. Live-Stk India* **4** pt. 2 pp. 189–196, 3 pls., 8 refs. Delhi, March 1934.

The author reviews from the literature the heavy losses attributed to infestation of cattle by warble-flies (*Hypoderma* spp.) in different parts of the world, together with the various measures adopted for their control. In British India, where the production of hides is estimated at 25–35 per cent. of that for the whole world, the annual loss is at least £1,500,000. Although the damage is primarily confined to hides, infestation may also result in deterioration of milk and several other minor ills. The species occurring in India are *Hypoderma lineatum*, Vill., which primarily attacks cattle but occasionally goats, and *H. crossi*, Patton, the true warble-fly of goats, which has also been recorded from cattle. They are almost confined to dry localities, such as north-western India, and are practically absent from the moister areas, such as Madras, Assam, Burma and Ceylon. The life-history of *H. lineatum* is briefly outlined.

BAUDET (E. A. F.) & DE BOER (E.). **Over het gebruik van derrispoeder, rotenon, teerpreparaten en terpentijn bij de bestrijding van de runderhorzellarve.** [On the Use of Derris Powder, Rotenone, Tar Products and Turpentine in the Control of the Larva of the Ox Warble-fly.]—*Tijdschr. Diergeneesk.* **60** pp. 639–647, 7 refs. Utrecht, 1933. (With Summaries in German, English and French.)

Experiments against *Hypoderma bovis*, DeG., on cattle in Holland were carried out with a water extract of derris made by soaking 10 lb. derris powder containing 2 per cent. rotenone in 9 gals. water for 24 hours, after which 2½ lb. soft soap dissolved in 1 gal. water is added. The extract must be prepared just prior to use. As a rule one application was sufficient, but a second a few days later ensured the death of all the larvae. The mixture was well brushed on to the backs of the animals, 5–14 fl. oz. being required for each. An ointment of vaseline containing 2 per cent. rotenone also gave excellent results, the hair round the warble being cut before its application. Rotenone dissolved in tar oil killed the larvae, but the resultant irritation makes it unsatisfactory in practice. Mixtures of rotenone with turpentine also produced irritation and were not so effective.

HARDY (G. H.). **Twelfth Annual Report of the Walter and Eliza Hall Fellow in Economic Biology.**—Fol. 17 pp. multigraph, 30 refs. Brisbane, Qd Univ., 15th March 1934.

The author discusses the results obtained in Australia during 1932–33 [*cf. R.A.E.*, B **21** 49] in investigations concerned chiefly with the

technique of breeding blow-flies [**22** 99] and the problem of their relation to the fleece of sheep. He concludes that attempts to reduce the number of flies or kill the maggots in the fleece are unsatisfactory, and that future research should be directed towards the determination and control of the bacteria responsible for conditions in the fleece that predispose it to attack and enable the maggots to thrive. The suggestion that bacterial activity is the prime factor in inducing blow-fly attack [**12** 138] was confirmed by his recent experiments. There are, however, two problems involved, first the factors attracting the adults and secondly the nutritive medium on which the maggots grow. The adults are presumably attracted to carrion by the smell, but it has been found that the maggots will develop in it even if it is sterile and has no odour. Adults were also attracted to oviposit on materials that afforded no food supply for the maggots.

The growth of maggots reared on a specially prepared rarified food [**22** 99] was hastened by the addition of wool-fat extracted from the fleece. Sweat, whether alone or in conjunction with the wool-fat, caused them to die rapidly. It is therefore probable that they do not feed on the yolk (wool-oil), as it is composed with sweat. Maggots apparently cannot thrive on normal sheep, and it seems possible that they exist only on some of the broken-down and waste materials from the animal cells or on exudations of cell-building material that may escape through abrasions. If the water-soluble substances that form their food could be rendered highly acid, the fleece might be more resistant, as they thrive best in a neutral or alkaline medium. Various pathogenic bacteria added to the rarified food had no beneficial effect on the maggots, and it is concluded that they are of importance only in the extent to which they release nutritive substances in chemical combination and soften food material already available. Of other substances tested in the rarified food, Bonney's Blue was slightly detrimental in heavy concentrations, but in small quantities had no adverse effect, whereas a trace of methylene blue too slight to colour the food killed all the maggots in 24 hours. Honey was as toxic to them as methylene blue, but sugar and sweet fruit juice had little or no detrimental effect. Sheep's faeces showed a strong deterrent action.

In experiments to simplify the breeding technique, a hanging cage for the flies, made of a cheesecloth bag mounted on a wooden frame, was evolved ; it has a celluloid top to admit light, a sleeve for side-entrance and a method of releasing the bottom to clean and dismantle the cage. Several cages were hung in a dark room in which an artificial daylight lamp supplied light and warmth in winter, or in a greenhouse, where the high temperatures in summer apparently produced no ill-effects. The eggs were removed daily, fresh carrion was placed inside for a few hours at a time alternately with sugar or honey, and water was supplied abundantly. Flies have been neglected for 5 days at a time without light, supplied only with water and sugar, and no ill-effects have been observed provided that precautions are taken against loss of water by evaporation. Flies may be added daily to a cage, but after a time both new and old flies will die off within a few days ; when the old stock is cleared out and a new colony started, no further ill-effects are noticed.

Eggs and larvae (chiefly of *Lucilia cuprina*, Wied., but also of *L. sericata*, Mg.) were placed on normal sheep and on a ram resistant to strike, but symptoms of strike were not induced until June 1933,

confirming the conclusion that sheep are normally resistant. On 10th and 11th June, eggs and newly hatched larvae respectively were placed on the ram at a point just above the tail. Maggots in the second instar were seen on 22nd and 23rd June in the fleece about ¼ inch away from the skin. It thus appears that they are able to exist at least for a time without apparent bacterial action and without causing irritation or decomposition [*cf.* **21** 208], although as they were not afterwards seen, it is thought that the food material was inadequate. In a second similar experiment on the same ram in October, the wool became stained 3 days after the maggots were placed on the animal, and typical symptoms of strike afterwards occurred. This is attributed to contamination with bacteria from a susceptible infested sheep in the same pen.

In view of reports concerning the relation of maggots to the soiling of wool by faeces, it has been shown that faeces do not offer a suitable food medium for larvae ; those taken from the matted lumps of soiled wool on newly-blown sheep proved to be *Musca domestica*, L. The occurrence of larvae of this species among blow-flies reported from advanced cases of strike may be due to the presence of faeces.

Addenda comprise a suggestion for a line of future research into the control of maggots on sheep, an annotated bibliography, and a copy of a paper already noticed [**22** 99].

KOBAYASHI (H.). **The Influence of Foods on the Fecundity of** *Musca domestica*.—*Keijo J. Méd.* **5** no. 1 pp. 35–67, 2 charts, 7 refs. Keijo, Chosen, March 1934.

An account is given of experiments in which adults of *Musca domestica*, L., were supplied with various types of food. It is concluded that saccharose or soluble starch is necessary for longevity and protein or peptone for maturation of the ovary.

PARISOT (J.) & FERNIER (L.). **The best Methods of treating Manure-heaps to prevent the Hatching of Flies.**—*Quart. Bull. Hlth Org. L.o.N.* **3** extract no. 1, 31 pp., 5 pls., 7 figs. Geneva, 1934.

In Lorraine, the villagers usually stack manure in front of their houses, a habit that promotes the breeding of flies. As the stacks are not usually made on a cement floor, it also leads to the infection of the subsoil water and consequently of wells that supply drinking water.

Counts were made of the bacteria carried externally by flies taken in the immediate proximity of manure-heaps, in village houses, in town flats and in the middle of a forest, and special tests were also made for *Bacillus coli*, the presence of which is an indication of extensive pollution. The figures obtained are only approximate, but it is concluded that all flies carry numerous micro-organisms. On flies caught near manure-heaps and in village houses *B. coli* was present in large numbers, whereas it was rare or absent on flies from town flats and from forests ; the number of colonies of micro-organisms on individual flies of the two categories ranged from 9,760,000 to 25,863,000 and from 60,000 to 4,080,000 respectively. Usually, however, the course of summer epidemics started and maintained by flies is not so severe as the potential infective power of the fly might lead one to expect. This fact is probably attributable to the natural sterilisation of the fly [*cf. R.A.E.*, B **16** 103], which would soon reduce its ability to transmit disease if it were not continually re-infected. Counts of bacteria on flies from

the same batch made at the time of capture and after two hours' exposure to the sun showed that the number was enormously reduced. As flies contaminate food-stuffs very rapidly and many of the latter contain all the elements necessary for the growth of bacteria, experiments were undertaken to determine the number of micro-organisms deposited by a fly on a solid culture medium. On an ordinary agar plate kept in contact for 10 minutes with an example of *Musca domestica*, L., from a town flat, the colonies were so numerous after 24 hours in the incubator that they were impossible to count. After one minute's contact, 93 colonies were counted. In a similar experiment with *Calliphora vomitoria*, L., 1,790 colonies were found, and, using flies from manure-heaps, between 1,500 and 4,000 colonies. As the manure-heaps are also used for human excreta, they are likely to contain bacteria pathogenic to man. A fly placed in contact with 500 cc. milk for 30 minutes produced so great a degree of contamination that after 24 hours it was necessary to dilute it in the proportion of one part to a million to secure isolated colonies, and it was estimated that there were more than 10,000 million bacteria per cc.

Details are given for the construction of a receptacle for manure that was found to give satisfactory results. It consisted of three contiguous water-tight chambers with a ventilation shaft covered with wire gauze to prevent the access of flies, trap-doors for filling, doors for emptying, a sloping floor, and a channel to convey the liquid to a cement tank with a pump, which was connected with the three chambers by a pipe to permit of " watering " the manure. Sluices permitted the watering of the contents of one chamber without the other two. The receptacle ensures the complete protection of the soil and excludes flies. The temperature of the manure was as much as 30–40°C. [54–72°F.] higher in the chambers than in ordinary stacks, and although the curve varied according to whether the manure was watered once or several times a day, it reached a maximum far in excess of that required to kill eggs and larvae of flies. Such temperatures had no unfavourable influence on the chemical composition and hence the agricultural value of the manure.

PARENTI (G.). **A proposito di un esteso esperimento di lotta contro le mosche.** [In Reference to an extensive Experiment against Flies.]—*Boll. Soc. ital. Biol. sper.* **9** no. 5 pp. 374–378. Milan, May 1934.

Commenting on the failure of a campaign against house-flies [*Musca domestica*, L.] at Rimini, where about 3,300 gals. of a spray of beet molasses, sodium arsenite and water were used, the author points out that the success obtained in similar work elsewhere [*R.A.E.*, B **20** 207] was due to the spray's containing other substances attractive to flies.

SIMMONS (J. S.), KELSER (R. A.) & CORNELL (V. H.). **Insect Transmission Experiments with Herpes-encephalitis Virus.**—*Science* **79** no. 2059 pp. 540–541. New York, 15th June 1934.

Continued experiments on the transmission of herpes viruses by *Aëdes aegypti*, L. [*R.A.E.*, B **21** 255] gave negative results.

Mathis (M.) & Baffet (O.). **Purification d'un élevage d'***Aëdes argenteus* **parasité par une grégarine,** *Lankesteria culicis* **(Ross).**—*Bull. Soc. Path. exot.* **27** no. 5 pp. 435–437, 5 refs. Paris, 1934.

Adults of *Aëdes aegypti*, L. (*argenteus*, Poir.) reared in Paris from eggs sent from Dakar were found to be parasitised by *Lankesteria culicis*, as many as 29 out of 35 mosquitos examined being infested. The sporocysts in large numbers (several hundreds) were found exclusively in the cells of the malpighian tubes. In order to eliminate the infestation, several females were isolated and fed on a rabbit. After 48 hours to allow for the elimination of excreta that normally follows a blood meal, they were transferred to another cage and during the following 48 hours oviposited on damp cotton-wool, which was immediately removed to avoid contamination. The eggs were divided into 3 batches and placed in water containing vegetable débris, similar except that the second receptacle also contained macerated bodies of infected adults and the third excreta from infected females. In serial sections from the adults obtained, numerous sporocysts were found in the 10 individuals of the second batch but none in the 45 of the other two batches, thus showing that the technique adopted had resulted in eliminating the infestation and that it is not contracted through the excreta.

Girard (G.) & Estrade (F.). **Faits nouveaux concernant la biologie de la** *X. cheopis* **et son rôle dans la persistance de l'endémie-épidémie pesteuse en Emyrne.**—*Bull. Soc. Path. exot.* **27** no. 5 pp. 456–458, 3 refs. Paris, 1934.

Débris resulting from the grinding of rice is commonly found in huts in the bush in the central part of Madagascar. *Xenopsylla cheopis*, Roths., was discovered, sometimes in large numbers, in collections of this débris taken from dark corners, the angles of stairs, the floors of rice granaries, etc. In an area where plague had occurred and huts had been abandoned by the inhabitants because they had seen dead rats, 14, 25 and 44 examples of *X. cheopis* were taken in three houses in different villages. Suspensions from each batch inoculated into a mouse and a guineapig brought about their deaths from plague in 3–5 days. In one of the houses a single dead rat had been seen 20 days before the fleas were collected. The fact remains that *X. cheopis* was never taken in traps, even when these were placed in infected houses, which had previously led the authors to believe that it occurred only in the fur of rats [*R.A.E.*, B **20** 148]. It had, however, been noticed that rats from the part of Tananarive that is a centre of the rice trade were more heavily infested than those from other quarters. This finding of *X. cheopis* in houses is of particular importance in connection with the transmission of plague in the high plateau regions of Madagascar, where climatic conditions are ideal for the prolonged maintenance of infectivity in the flea.

Estrade (F.). **Technique et appareil pour la capture des puces dans les poussières et débris de céréales.**—*Bull. Soc. Path. exot.* **27** no. 5 pp. 458–461, 3 figs. Paris, 1934.

The author describes an apparatus that has been used successfully for obtaining fleas present in dust or débris [*cf.* preceding paper]. The débris is collected in a funnel consisting of two truncated cones

joined by their narrow ends, the lower one being closed by a tightly fitting removable base, 22 cm. in diameter with an edge 2 cm. high. A projecting stud on this base is made to fit a hole in the centre of a raised platform 20 cm. in diameter and 2 cm. high surrounded by a trough 20 cm. wide with an edge 20 cm. high sloping inwards. The trough, which is filled with water or an insecticide, can be emptied by means of a small pipe at the side. The base of the funnel is fixed on the platform, the top is removed and the fleas hop out and are drowned.

ROUBAUD (E.) & TREILLARD (M.). **Influence de la nourriture larvaire sur le développement et le comportement agressif des anophèles. Note préliminaire.**—*Bull. Soc. Path. exot.* **27** no. 5 pp. 461–467, 4 refs. Paris, 1934.

In view of the fact that in the case of *Culex pipiens*, L., the nourishment of the larvae has been shown to influence the behaviour of the adults [*R.A.E.*, B **19** 215], experiments were undertaken to determine its effect in that of *Anopheles maculipennis* var. *messeae*, Flni., from southern Italy. Larvae from the same lot of eggs were divided into three equal batches, one of which was fed exclusively on animal matter (powdered dried ox spleen), one on vegetable matter (powdered spinach leaves) and the other on a mixture of equal quantities of wheat flour, bark algae and powdered spleen. To limit the amount of decomposition of these materials and the associated microfauna and microflora, they were sprinkled in a thin film on the water, which was changed daily. On emergence, the adults were isolated individually with no nourishment but water, and each day their desire to suck blood was tested by placing them in contact with the arm of the same person.

Larvae fed on spleen developed more rapidly and gave rise to larger adults than those fed on spinach but the rate of mortality was higher. Intermediate results were obtained with larvae fed on a mixed diet. Adults derived from larvae fed on spinach and on a mixed diet showed an earlier and more active desire for a blood meal than those from larvae fed on spleen.

RAYNAL (J.) & LE GAC (P.). **Sur la présence de *Phlebotomus ariasi* ♂ et ♀ à Capvern.**—*Bull. Soc. Path. exot.* **27** no. 5 pp. 467–473, 2 figs., 5 refs. Paris, 1934.

In August 1933, six females and one male of *Phlebotomus* were taken at Capvern (Hautes-Pyrénées). Descriptions are given of the male, which is undoubtedly that of *P. ariasi*, Tonn., and of five of the females, which are considered to belong to the same species, as they are similar to and were taken with it. As they are also similar to those obtained at the same place in 1932 [*R.A.E.*, B **21** 169], this finding confirms the authors' previous tentative identification.

GRIZAUD (H.). **Au sujet de quelques cas de " Fièvre Rouge " à la Guadeloupe.**—*Bull. Soc. Path. exot.* **27** no. 5 pp. 475–482, 8 refs. Paris, 1934.

In the course of this paper on a disease observed in Guadeloupe and adjacent islands and called " fièvre rouge antillaise," it is suggested that it may be transmitted by a mosquito ; the most abundant species in some areas where the disease occurs is *Aëdes aegypti*, L.

Sicault (G.). **Note sur l'adaptation du *Gambusia holbrooki* aux eaux salées.**—*Bull. Soc. Path. exot.* **27** no. 5 pp. 485–488. Paris, 1934.

In view of the fact that in Morocco Anophelines breed in brackish water in certain lagoons, experiments were undertaken to determine whether *Gambusia holbrooki* could be used for their control. It was found that these fish could be transferred from fresh water to water containing at least 11 gm. sodium chloride per litre without causing their death or diminishing their capacity for feeding on mosquito larvae. By progressively increasing the quantity of NaCl it was possible to accustom them to a concentration of 33 gm. per litre, but at 18 gm. they did not feed so readily, at 26 gm. feeding ceased and there was an appreciable mortality, and at 35 gm. all the fish died.

Sedel (C.). **Rapport annuel sur la situation de l'agriculture de la Province du Katanga (année 1932). Service phytopathologique.**—*Bull. agric. Congo belge* **24** no. 3 pp. 311–319, 6 figs. Brussels, September 1933. [Recd. June 1934.]

The use of the Harris trap [*R.A.E.*, A **19** 78] in Katanga (Belgian Congo) did not give satisfactory results in 1931 against *Glossina morsitans*, Westw., but 1,481 individuals of *G. palpalis*, R.-D., were caught in one month in 1932 in a single trap placed at a river crossing, which, as a result, is now free from the flies.

Smith (R. O. A.), Krishnan (K. V.) & Mukerji (S.). **Identification of Larvae of the Genus *Phlebotomus*.**—*Indian J. med. Res.* **21** no. 4 pp. 661–667, 2 pls., 6 refs. Calcutta, April 1934.

Characters are described distinguishing the larvae of *Phlebotomus argentipes*, Ann. & Brun., *P. papatasii*, Scop., and an unidentified species of the group of *P. minutus*, Rond., the three most common sand-flies in Bengal, and a brief note is given on the technique used for clearing and mounting specimens.

Iyengar (M. O. T.). **Rat-flea Survey of Peermade District, Travancore.**—*Indian J. med. Res.* **21** no. 4 pp. 723–730, 1 map, 1 ref. Calcutta, April 1934.

Following the occurrence of several cases of plague, a rat-flea survey of the inhabited area of the Peermade District (Travancore) was carried out from September 1932 to March 1933. Of the rodents trapped in dwellings, almost all were *Mus* (*Rattus*) *rattus*, which appeared to be the principal host of rat-fleas. Of these, *Xenopsylla cheopis*, Roths., and *X. astia*, Roths., were the commonest. The former comprised 68·9 per cent. and the latter 1·6 per cent. of the total flea fauna collected in 77 localities in the eastern part of the District, where the altitude is generally more than 2,200 ft., whereas in the western part, where the altitude ranges from 200 to 1,200 ft. and the climate is warmer and more humid, only one example of *X. cheopis* was taken and *X. astia* formed 96·1 per cent. of the fleas collected in 33 localities. Of the other fleas found on the rats, *Ceratophyllus nilgiriensis*, J. & R., *Leptopsylla himalaica*, Roths., and *Pulex irritans*, L., which prefer cool climates, were absent in the lower area and *Stivalius ahalae*, Roths., was scarce (0·9 per cent., as compared with 12·2 per cent. in the high region). On the other hand, *X. brasiliensis*, Baker, was more prevalent

in the lower area (2·7 per cent.) than in the higher one (0.2). *Echidnophaga gallinacea*, Westw., and *Ctenocephalides* (*Ctenocephalus*) *felis orientis*, Jord., also occurred on the rats, and the latter and *P. irritans* on man. No marked difference was observed in the nature of the population or the type of habitation in the two areas.

Shortt (H. E.), Poole (L. T.) & Stephens (E. D.). **Sandfly Fever on the Indian Frontier. A Preliminary Note on some Laboratory Investigations.**—*Indian J. med. Res.* **21** no. 4 pp. 775–788, 5 charts, 10 refs. Calcutta, April 1934.

In the course of laboratory investigations on sand-fly fever, examples of *Phlebotomus papatasii*, Scop., that had fed on infected persons induced the disease in one or possibly two out of eight volunteers in a non-endemic area. In view of the long incubation period (10 days) in the second case, the diagnosis of sand-fly fever is made with reserve. In these two experiments, the flies may be said to have become infective between a minimum of 6 and a maximum of 8 days.

Baber (E.). **Note on Experiments made with the Object of finding an efficient and economical Insecticide Spray for the Destruction of Mosquitoes and Flies.**—*J. roy. Army med. Cps* **62** no. 6 pp. 411–418. London, June 1934.

Tests were carried out with a number of preparations, particularly with liquid extracts of pyrethrum, in an attempt to discover a cheap and effective spray for use against flies and mosquitos in South Africa.

The technique of the experiments, which were made on *Musca domestica*, L., and various Culicines, is described. Mosquitos proved to be much more susceptible than flies, particularly to pyrethrum. The killing power of the sprays could not be judged by the number of insects apparently dead in 3 hours or less, as some recovered after this lapse of time ; the number dead after 12 hours was therefore recorded. A saturated solution of naphthalene in kerosene proved to be moderately effective and has the advantage of being cheap. Proprietary extracts of pyrethrum were very effective, and the addition of citronella oil definitely increased their toxicity ; the most satisfactory formula was 1 part of a proprietary extract of pyrethrum to 64 parts of kerosene with the addition of 5 per cent. citronella oil and 15 per cent. petrol (the latter being introduced to increase the volatility of the kerosene).

Christophers (Sir S. R.). **Malaria from a Zoological Point of View.**—*Proc. roy. Soc. Med.* **27** no. 8 pp. 991–1000, 22 refs. London, June 1934. (With Summaries in French and German.)

In discussing the relative frequency with which the various groups of protozoan blood-parasites occur in man and other mammals, the author points out that, although the groups of parasites have an apparent relation with the original stems from which their vertebrate hosts are derived, they seem to have an even closer one with the particular blood-sucking Arthropods favoured by the mode of life of the latter. Ungulates and carnivora are usually infested with ticks, When undergoing evolution, these animals lived chiefly in large herds that roamed over more or less arid country, and such conditions

favoured chiefly the evolution of blood-parasites that could utilise the tick as an intermediate host. Birds, bats and monkeys tend to live among trees in a more sheltered, humid environment, where they are more liable to attack by mosquitos. *Plasmodium*, once adapted to a particular mammalian stem, would tend to be restricted to it, but the idea that blood-parasites have evolved from forms that originated in the invertebrate host seems to be most in keeping with known facts, particularly as it is usually the sexual stage that is passed in the latter. From this point of view, man may be regarded as continuing to harbour parasites acquired at some remote period when his progenitors lived in close association with Anophelines, probably in the forest.

PAPERS NOTICED BY TITLE ONLY.

GRAHAM-SMITH (G. S.). **The Alimentary Canal of** *Calliphora erythrocephala*, **with special Reference to its Musculature and to the Proventriculus, Rectal Valve and Rectal Papillae.**—*Parasitology* **26** no. 2 pp. 176–248, 5 pls. Cambridge, 23rd June 1934.

PROUTY (M. J.) & COATNEY (G. R.). **Further Studies on the Biology of the Pigeon Fly,** *Pseudolynchia maura* **Bigot (Diptera Hippoboscidae).**—*Parasitology* **26** no. 2 pp. 249–258, 9 refs. Cambridge, June 1934. [*Cf. R.A.E.*, B **22** 42.]

HARVEY (W. H.). **A Case of Myiasis, due to** *Calliphora erythrocephala*, **occurring in Man** [in England].—*Parasitology* **26** no. 2 pp. 306–307, 3 refs. Cambridge, 23rd June 1934.

ENDERLEIN (G.). **Entomologische Ergebnisse der Deutsch-Russichen Alai-Pamir-Expedition 1928 (III). 1. Diptera** [including one new genus and 2 new species of Tabanids].—*Dtsch. ent. Z.* 1933 no. 2–3, pp. 129–146, 3 figs. Berlin, February 1934.

GOETGHEBUER (M.). **Ceratopogonides** [including *Dasyhelea dasyptera*, sp. n.] **et Chironomides recueillis en Palestine.**—*Bull. Ann. Soc. ent. Belg.* **74** no. 5–6 pp. 214–216, 4 figs. Brussels, 26th June 1934.

MATHESON (R.). **Notes on Mosquitoes from South America, with a Description of a new Species** [*Culex putumayensis* from the Brazil-Peru Frontier] **(Diptera, Culicidae).**—*Proc. ent. Soc. Wash.* **36** no. 5 pp. 120–122, 1 fig. Washington, D.C., May 1934.

BROQUET (C.). **Questions concernant la leishmaniose viscérale dans le Bassin Méditerranéen** [a brief summary of present knowledge]. —*Bull. Off. int. Hyg. publ.* **26** no. 5 pp. 893–903. Paris, May 1934.

HENNESSEY (R. S. F.). **Typhus Fever in Uganda.**—*E. Afr. med. J.* **11** no. 2 pp. 42–60. Nairobi, May 1934. [*Cf. R.A.E.*, B **22** 83.]

DA FONSECA (F.). **Notas de acareologia VIII. Curiosa modalidade de parasitismo em ♂ ♂ de** *Amblyomma longirostre* **(Koch, 1844) e comentario sobre a morfologia dêste carrapato.** [A curious Method of Attachment of the Males of *A. longirostre* (to the quills of a porcupine) and some Remarks on the Morphology of this Tick.]—*Bol. biol.* N.S. **1** no. 2 pp. 57–59, 1 fig. S. Paulo, December 1933. [Recd. June 1934.]

DUKE (H. L.). **On the Transmissibility by *Glossina* of *Trypanosoma brucei*, *T. rhodesiense* and *T. gambiense*, with special Reference to old Laboratory Strains.**—*Parasitology* **26** no. 2 pp. 153–162, 14 refs. Cambridge, June 1934.

After briefly reviewing previous work on the transmissibility of strains of trypanosomes by tsetse-flies, the author states that he has no doubt that certain trypanosomes of the polymorphic group are very liable to lose the power of cyclical development in *Glossina*, although the conditions that determine the onset of this change are not yet fully understood. *Trypanosoma brucei* and *T. rhodesiense* appear to be less likely to suffer the loss than *T. gambiense*. It is possible that much depends on the vertebrate host, and evidence is steadily accumulating to show that the antelope of Africa are peculiarly suited to these three important trypanosomes. The ability of *T. gambiense* to survive for at least 22 months in an antelope was demonstrated in Uganda before 1912, and more recent experiments at Entebbe have shown a similar or even closer adjustment in the case of *T. rhodesiense*. Descriptions are given of the history of ten strains, comprising these three trypanosomes, most of which had been maintained for a long time in laboratories away from any contact with tsetse-flies. The results of experiments (which are set out in a table) show that the majority of the strains are non-transmissible by *Glossina*, even though some of the flies used in the tests were maintained at 95–97°F. during their infecting feeds [*cf. R.A.E.*, B **20** 275 ; **21** 278].

MACLEOD (J.). *Ixodes ricinus* **in Relation to its Physical Environment : the Influence of Climate on Development.**—*Parasitology* **26** no. 2 pp. 282–305, 6 graphs, 8 refs. Cambridge, June 1934.

Although a considerable amount of work has been done on the relations of insects to their environment, practically nothing is known of the ecology of ticks. The only tick of major importance in Britain is *Ixodes ricinus*, L., the vector of redwater [*Piroplasma bigeminum*] in cattle and of louping-ill and tick-borne fever in sheep. Following a study of its bionomics [*R.A.E.*, B **20** 274], the author undertook laboratory investigations to determine the effects and inter-effects of different physical factors in the environmental complex on the development of engorged larvae and nymphs.

Experiments in which either temperature or humidity was constant show that the optimum temperature for rapidity of development is dependent on humidity and conversely that the optimum humidity is dependent on temperature. Development, at a greater or less rate, is possible over a range of temperatures from about 15°C. [59°F.] to 35°C. [95°F.], but the range of relative humidities is comparatively small, the lower limit being about 80–85 per cent., and for the greater part of the temperature range favourable for comparatively rapid development 100 per cent. is required. Moderate fluctuations of temperature within the favourable limits do not accelerate development appreciably and probably produce a slight retardation. A method of calculating the theoretical time that would be taken for development at temperatures below and above those at which the tick survives is given, and these values are calculated for different temperatures. Using the figures for development at various temperatures, the author shows that the threshold of development obtained is not constant and each day-degree has not therefore a uniform developmental value ; it

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is thus apparent that the thermal constant theory [*cf.* A **13** 389] cannot safely be used as a basis for calculating the threshold of development in this case. Experiments on the inter-effects of temperature and humidity variations and on the influence of barometric pressure on development and moulting were also carried out, and the results are discussed. It seems probable that slight fluctuations of barometric pressure, such as occur naturally, would have no effect on development or ecdysis.

Dunn (L. H.). **Prevalence and Importance of the Tropical Warble Fly, *Dermatobia hominis* Linn., in Panama.**—*J. Parasit.* **20** no. 4 pp. 219–226, 8 refs. Baltimore, Md, June 1934.

Cases of cutaneous myiasis caused by *Dermatobia hominis*, Say, are of frequent occurrence in many parts of the Republic of Panama and the Canal Zone, and records of early exploration show that this Oestrid has been known there for many years. It is found most often in the coastal plains or forest regions, and at times becomes very numerous in areas where cattle are raised, although it seems to vary greatly in its annual incidence. The sites of warbles in man do not indicate that the larvae prefer any particular part of the body; they occur about as frequently on parts covered by clothing as on those that are usually exposed. In children they seem to be found about the head and neck somewhat more often than elsewhere, and an account is given of a case in which infestation of the brain following penetration of the fontanelle caused the death of a child 1½ years old. Cattle may be very heavily infested, and so many were killed between 1927 and 1930 in the Canal Zone that the practice of fattening them on pastures had to be abandoned. The number of cattle on pastures was reduced from 5,908 in 1927 to 356 in 1930, and thousands of acres of land that were cleared, fenced and planted with rich grasses remain unoccupied.

Of 70 lean steers placed on the day after their arrival (20th February 1930) in a pasture in which no cattle had grazed for more than a year and which had been burned over in the interval, several were found to be infested with numerous larvae on 14th March, the size of some of the latter indicating that the animals had been attacked shortly after their introduction. On 29th March many of them were found to be heavily infested, and close examination of one revealed a number of empty warble pockets, showing that larvae may mature in cattle in less than 37 days. It is thus obvious that *Dermatobia* and Diptera that carry its eggs were abundant in this area, despite the fact that the nearest occupied pasture was more than a mile away. These pastures in the Canal Zone apparently offer optimum conditions for the development of the fly, as it seldom becomes so troublesome in other sections. Sheep, dogs, cats and various wild animals are also known to be infested.

Jellison (W. L.). **The Parasitism of Lizards by *Ixodes ricinus californicus*.**—*J. Parasit.* **20** no. 4 p. 243. Baltimore, Md, June 1934.

During March and April 1932, numerous collections were made in various localities in California of *Ixodes ricinus californicus*, Banks, which is a serious pest of deer and domestic animals and frequently bites man. Adults were taken in considerable numbers from vegetation and were also found infesting dogs, horses and man. The immature stages were collected only on alligators and lizards, except in one

instance when an engorged nymph was taken from a dog. Since lizards are abundant and the ticks were found on them in large numbers, the author considers that they are important hosts, particularly as in one locality where they were numerous, over 250 adults were collected from vegetation in a few hours and no other small animals that might have served as hosts for the immature stages were seen.

MARTINI (E.). *Monomorium* **in Krankenhäusern** [Hospitals].—*Anz. Schädlingsk.* **10** no. 6 pp. 71–72. Berlin, June 1934.

Instances observed in various countries are cited of the invasion of hospitals by ants of the genus *Monomorium*, which sometimes attacked infants in them. The possibility of these ants being concerned in the spread of disease is very briefly discussed.

THOMPSON (G. B.). **The Parasites of British Birds and Mammals. 1. Notes and Records.**—*Ent. mon. Mag.* **70** no. 841 pp. 133–136, 9 refs. London, June 1934.

THOMPSON (G. B.). **Association of Siphonaptera with Mallophaga.**—*T.c.* p. 136.

The first paper includes further instances [*cf. R.A.E.*, B **21** 269] of Mallophaga being attached to Hippoboscids (*Ornithomyia*) associated with birds, and the second records the finding of two examples of *Trichodectes melis*, F., on a flea taken on a badger in the Crimea.

Literature relating to the Use of Maggots in the Treatment of Suppurative Infections.—[*Circ.*] *U.S. Dep. Agric. Bur. Ent.* E-310, 7 pp. multigraph. Washington, D.C., 15th October 1933. [Recd. July 1934.]

ROBINSON (W.). **The Culture of Sterile Maggots for Use in the Treatment of Osteomyelitis and other Suppurative Infections.**—E-311, 10 pp. multigraph. November 1933. [Recd. July 1934.]

ROBINSON (W.). **Problems in the Application of the Maggot Treatment of Osteomyelitis and other Suppurative Infections.**—E-312, 7 pp. multigraph. December 1933. [Recd. July 1934.]

The second circular is a revision of a previous one [*R.A.E.*, B **21** 174] on the breeding of blow-fly larvae for use in the treatment of osteomyelitis, etc., in the United States, including the latest information on the technique of rearing and sterilisation. *Calliphora erythrocephala* Mg., does not give such satisfactory results in the wound as the other blow-flies recommended [*loc. cit.*] and is also a more difficult species to rear.

In the third paper, notes are given on questions connected with the technique of the application of the maggots to wounds.

BOYD (M. F.) & MULRENNAN (J. A.). **The Establishment of a Cage Colony of** *Anopheles punctipennis*.—*Ann. ent. Soc. Amer.* **27** no. 2 pp. 311–312, 2 refs. Columbus, Ohio, June 1934.

Notes are given on the rearing of *Anopheles punctipennis*, Say, which has been successfully accomplished in Florida by employing the technique described for *A. quadrimaculatus*, Say [*R.A.E.*, B **21** 36, 150].

Roudabush (R. L.) & Becker (E. R.). **The Tropical Rat Flea in the Interior of the United States.**—*Science* **80** no. 2065, p. 97. New York, 27th July 1934.

Xenopsylla cheopis, Roths., is recorded for the first time from Iowa. Of 259 fleas from 6 rats shot in July 1934, 257 were *X. cheopis* and 2 *Ceratophyllus fasciatus*, Bosc.

Rees (C. W.). **Transmission of Anaplasmosis by various Species of Ticks.**—*Tech. Bull. U.S. Dep. Agric.* no. 418,17 pp., 2 figs., 22 refs. Washington, D.C., April 1934.

From a review of the literature, it appears that the following species of ticks have been found to transmit anaplasmosis of cattle in various parts of the world: *Boophilus annulatus*, Say, with its subspecies *decoloratus*, Koch, and *microplus*, Can., *Rhipicephalus simus*, Koch, *R. bursa*, C. & F., *Ixodes ricinus*, L., and *Hyalomma lusitanicum*, Koch. In addition, *R. sanguineus*, Latr., *Dermacentor variabilis*, Say, and *D. venustus*, Banks (*andersoni*, Stiles) have been shown [*R.A.E.*, B **19** 66; **20** 136; **21** 70] to be vectors in the United States.

Various improvements in the technique of rearing ticks have been evolved by the author and were used in Louisiana in connection with the experiments on transmission described in this paper. Cloth bags containing ticks may be kept on rabbits' ears by covering each bag with a cylinder of ordinary fine-mesh wire screen such as is used against mosquitos. Chicks 2–10 weeks old may be used for engorging larvae and nymphs, which are applied to the wings in bags made of silk bolting cloth, after the larger feathers have been clipped; the ticks can be observed through the thin cloth without removing the bags. Adhesive tape was found to be superior to draw-strings for fastening bags to the ears of rabbits, dogs and cattle, the scrotum of bulls or the wings of chicks. Garments attached round the belly and hind legs of cattle were used to collect larvae and nymphs.

Negative results were obtained with *Amblyomma americanum*, L. [*cf.* **18** 101], *A. cayennense*, F., *A. maculatum*, Koch, and *Ixodes sculptus*, Neum. The disease was, however, transmitted by nymphs of *R. sanguineus* infected as larvae and by adults infected as nymphs, and by nymphs of *I. scapularis*, Say, infected as larvae, this species not having been previously shown to be a vector. It was also transmitted in some experiments by larvae of *B. annulatus* that were the offspring of infected females [*cf.* **22** 57, 58], but hereditary transmission by other species could not be demonstrated.

Wilson (J. L.), Pearson (A. M.) & Cannon (C. Y.). **The Effects of some Fly Sprays on the Hides and on the Body Temperatures of Dairy Cows.**—*J. Dairy Sci.* **16** no. 5 pp. 427–433, 1 fig., 5 refs. Baltimore, Md, September 1933. [Recd. July 1934.]

The experiments described were carried out in Iowa during the summer of 1931 to determine the physiological effect on cows of oil sprays that might be repellent to flies, the effect of the sprays on the flies having already been dealt with [*R.A.E.*, B **21** 110].

The following is the author's summary: Twelve fly-repellent oils [containing various unspecified toxic and repellent ingredients] sprayed

at the rate of two fluid ounces per day differed widely in their physiological effects upon the skin of dairy cattle. Seven of them caused no skin injury when sprayed over a two months' period. Five oils caused noticeable injury as indicated by loss of hair and cracking or peeling of the skin. The injury was most evident on those portions of the body most exposed to the sun's rays. The amount of injury caused by the sprays was influenced by the method of application. Cows varied in their susceptibility to skin injury.

During periods in which the maximum daily air temperatures averaged 86°F., the body temperatures of sprayed animals were slightly higher than those of unsprayed animals [*cf.* **22** 134]. The temperatures of cows sprayed with 5 of the 11 oils did not show marked variations from those of the unsprayed cows. Application of the other 6 oils caused definite, though not dangerous, temperature rises. The elevations of body temperatures were more pronounced at higher air temperatures.

MOORE (W.). **Esters as Repellents.**—*J. N. Y. ent. Soc.* **42** no. 2 pp. 185–192. New York, June 1934.

With a view to the ultimate discovery of a repellent for Diptera that would have no apparent odour, experiments were made to determine what class of chemical was repellent. Data on tests with mosquitos and a number of essential oils, terpenes and their esters had indicated that terpene alcohols as a class were more effective than terpene hydrocarbons, and that in each instance the ester was superior to the corresponding alcohol.

The author's experiments, which are described, were carried out against *Musca domestica*, L., and other flies. They confirmed the suggestion that all esters are more effective than the corresponding alcohols, and also showed that the saturated alcohol, menthol, is inferior to the unsaturated alcohols and that the hydrocarbon, oil of cedarwood, is inferior to all alcohols except menthol. The most satisfactory compound was a very slightly volatile, unsaturated, cyclic ester (santalyl acetate). Extensive field and laboratory experiments with cyclic esters demonstrated the superior repellent properties of the dialkyl phthalates and of the pyrethrins, both of which are odourless, and led to the development of a proprietary fly spray for cattle.

BUXTON (P. A.). **Separation of Lice from Hair, Wool or Feathers.**—*Proc. R. ent. Soc. Lond.* **9** pt. 1 pp. 5–6. London, 30th June 1934.

The author describes a method for removing lice from hair, wool or feathers by dissolving these in a solution of 2 per cent. sodium sulphide and 2 per cent. potassium hydroxide in water, which is then filtered. As the lice are transparent and difficult to see, they should be washed off the filter paper with distilled water and stained with eosin (other stains, such as fuchsin and carmine, being destroyed by traces of the reagent that remain in the specimens). The black pigment that is so abundant in black hair and feathers will not pass through a filter paper, but may be removed by shaking the solution in a separating funnel with paraffin oil; the lice float in the oil, and the black liquid can be drawn off through the cock at the bottom.

Wladimirow (M.) & Smirnov (E.). **Ueber das Verhalten der Schlupfwespe *Mormoniella vitripennis* Wlk. zu verschiedenen Fliegenarten.** [On the Behaviour of *M. vitripennis* with Regard to various Species of Flies.]—*Zool. Anz.* **107** no. 3–4 pp. 85–89, 5 refs. Leipzig, 15th July 1934.

Experiments to determine the relative attractiveness of puparia of *Calliphora erythrocephala*, Mg., *Lucilia caesar*, L., *Phormia terrae-novae*, R.-D. (*groenlandica*, Zett.) and *Musca domestica*, L., to *Mormoniella vitripennis*, Wlk., showed a preference by the Chalcid for these hosts in the order given.

Chen (H. T.). **Reactions of *Ctenocephalides felis* to *Dipylidium caninum*.**—*Z. Parasitenk.* **6** no. 5 pp. 603–637, 1 pl., 31 figs., 3 pp. refs. Berlin, 21st July 1934.

The following is taken from the author's summary: The literature on immunity from infection in insects is reviewed. Little is known concerning insect reactions to helminth infections. A résumé is given of the life-history of fleas in general and of the tapeworm, *Dipylidium caninum*. In the author's investigations, in which almost all the fleas used were *Ctenocephalides felis*, Bch., the tapeworm embryos hatched in the ventriculus of the flea larva and immediately began to migrate through the intestinal epithelium into the body cavity. The growth of the cysticercoids was slow during the larval stage of the flea, but they increased rapidly in size in the pupa and adult. Although all larvae appeared equally voracious when given an infective meal, the heaviest infections occurred among those of the later instars, owing to a larger mouth-cavity permitting the ingestion of more tapeworm eggs and egg pockets. Over 35 per cent. of the infested larvae died in 24–48 hours after infection. A second period of marked mortality occurred immediately before pupation and a third during the pupal stage.

The literature on the blood cells of insects is reviewed, and the blood elements of fleas are studied and classified. All three types of leucocytes recognised in flea blood, pre-amoebocytes, amoebocytes and macrocytes, respond in the reaction to the tapeworms. A diagrammatic chronological representation of what occurs in infected fleas is given.

Jimenez Gomez (J.) & Paniagua (V.). **Estado actual de nuestros conocimientos sobre la biologia de la *Myzomyia hispaniola*.** [The present State of our Knowledge on the Biology of *Anopheles hispaniola*.]—*Med. Países cálidos* **7** no. 6 pp. 267–274. Madrid, June 1934.

An account is given of observations on *Anopheles* (*Myzomyia*) *hispaniola*, Theo., in various parts of Spain, particularly in the Province of Granada. Several generations occurred during the year, the number varying according to the locality. Larvae could be found as early as April, but were most numerous between August and December. They occurred in clean and constantly renewed cold water such as is found in hill streams, but they were able to live for some time in wet mud. The water had a pH of 7–7·6. In back-waters with a rocky floor and abundant algae, they were associated with larvae of *A. maculipennis*, Mg. The maximum altitude of the breeding-places was about 4,000 ft. The adult mosquitos were found in animal quarters and in tree holes,

etc., but seldom entered houses except in autumn. It is doubtful whether they are of any importance as vectors of malaria ; no infection was found in numerous females examined.

Maldonado Sampedro (M.). **La lucha antipaludica en la Sociedad de Peñarroya (1928–1932).** [Antimalarial Work in 1928–32 in the District of the Peñarroya Company.]—*Med. Países cálidos* **7** no. 6 pp. 275–290, 3 figs. Madrid, June 1934.

The work described was carried out in a small area comprising two villages in Spain, and included treatment with quinine and plasmoquine and the use of Paris green against Anopheline larvae. An appreciable reduction of malaria was recorded.

A list is given of the mosquitos found ; the Anophelines were *Anopheles maculipennis*, Mg., *A. claviger*, Mg. (*bifurcatus*, auct.), and *A.* (*Myzomyia*) *hispaniola*, Theo.

Roubaud (E.) & Mezger (J.). **Sur la sensibilité au paludisme des oiseaux** (*Plasmodium relictum*) **des divers peuplements raciaux du moustique commun,** *Culex pipiens* **L.**—*C. R. Acad. Sci. Fr.* **99** no. 2 pp. 170–172, 4 refs. Paris, 1934.

Examples of the three races of *Culex pipiens*, L., previously noticed [*R.A.E.*, B **21** 267] were fed on canaries heavily infected with *Plasmodium praecox* (*relictum*). A fairly high percentage of individuals of the non-autogenous French and Algerian races proved refractory to infection [*cf.* **22** 48], whereas 100 per cent. of the autogenous urban French race became infected.

Antunes (P. C. de A.) & Lane (J.). **Nota sobre a distribuição geografica dos culicideos (Diptera) de São Paulo (Brasil).** [Note on the geographical Distribution of the Culicids of São Paulo (Brazil).] —*Rev. Biol. Hyg.* **4** no. 3 pp. 91–97. São Paulo, December 1933.

The 41 mosquitos here dealt with [*cf. R.A.E.*, B **21** 262] include 8 species of *Anopheles*, viz., *A. albitarsis*, Arrib., *A. argyritarsis*, R.-D., *A. bachmanni*, Petrocchi, *A. darlingi*, Root, *A. tarsimaculatus*, Goeldi, *A. peryassui*, D. & K., *A. parvus*, Chagas, and *A. bellator* var. *cruzi*, D. & K.

Swan (D. C.). **The Hay Itch Mite,** *Pediculoides ventricosus* **(Newport) (Acarina, Pediculoididae) in South Australia.**—*J. Dep. Agric. S. Aust.* **37** no. 10 pp. 1289–1299, 7 figs., 18 refs. Adelaide, 15th May 1934.

During the past few years, the occurrence of a skin affection known as " hay itch," which appears to be caused by *Pediculoides ventricosus*, Newp., has been reported from widely separated localities in South Australia, chiefly among workers handling agricultural products, particularly grain, chaff and hay taken from stacks a year or more old. Several samples of hay from localities near Adelaide were found to harbour considerable numbers of this mite, which has not previously been recorded from Australia. An " itch " of workers engaged in chaff-cutting operations has also been known for a long time in Western Australia, and has been reported from the eastern States. A brief account of the occurrence of this mite in other parts of the world is

given. In Australia its most important host appears to be *Sitotroga cerealella*, Ol. (Angoumois grain moth), the larvae of which feed in the grains of various cereals, either stored or in the ear ; in haystacks, they attack the ripened ears of wheat and oats, which are the most general hay crops in the cereal belt. A temperature of about 80°F. and a high relative humidity (up to 80 per cent.) are favourable to the moth, and as these conditions often occur in haystacks, the mites in such situations thrive owing to the abundance of their hosts, being most prevalent during hot summer weather. A detailed account is given of the bionomics of the mite, taken from observations made by the author on material bred in the laboratory during 1933, which largely confirm those of Herfs [*R.A.E.*, A **14** 564]. Females that are dislodged when only partly engorged and cannot regain their host, owing to their cumbersome shape and weight, still produce young, but in much smaller numbers than is normal ; any slight degree of engorgement appears to be sufficient to enable some young to be produced. If numbers of mites attack a single host larva, it may be immobilised in about 24 hours ; with only a few mites, the period is longer. The methods employed in breeding the mites are outlined, and descriptions are given of the mouth-parts of the female and of certain structural features of both sexes. The author reviews the literature on the relation of this mite to certain skin affections of man and records observations on the effects of its bites on himself.

In Australia, it is the standard practice to cut the wheat and oats for hay some time after flowering, since buyers prefer hay containing well-developed grain in the ears and an appreciably greater yield is thus obtained. The original grain content of such material may, however, be much reduced before use by *S. cerealella* or mice and by falling out. It is therefore suggested that the hay should be cut at the time of flowering. The greater digestibility and nutritive value of cereals at this stage and the reduction in injury by mice would compensate for the decrease in yield, and the grain moth (and consequently the mite) would be controlled and the possibility of " hay itch " greatly reduced. An alternative method of conserving forage cut early would be as stack silage. If a stack is to be made from a crop cut late on a farm where " hay itch " is known to occur, mite infestation should be avoided by building it on a new site at some distance from the old ones, and no old hay that might contain overwintering mites should be used for flooring or thatching.

Isaac (P. V.). **The Life-history and Seasonal Abundance of the Vesicating Beetle, *Paederus fuscipes* Curt.**—*Indian J. agric. Sci.* **4** pt. 1 pp. 200–202, 1 pl., 2 refs. Delhi, February 1934. [Recd. July 1934.]

Further notes are given on the Staphylinid, *Paederus fuscipes*, Curt., in Bihar [*cf. R.A.E.*, B **21** 193], with descriptions of the immature stages. Breeding takes place in damp, porous soil, rich in decaying matter, along the banks of rivers, irrigation channels, drains and pools, a few inches above the edge of the water. Eggs, larvae and pupae may be found in cracks or under leaves at a depth of ½–2 ins. The beetles feed on algae, decaying vegetable and animal matter, live tadpoles, moths and Syrphid larvae. The female lays about 6 eggs a day for several days, depositing them singly about an inch below the surface of the soil, generally in the early morning. Larvae hatch in 2–3 days,

feed in the soil on decaying matter, tadpoles and Syrphid larvae for about a week and then pupate, the pupal period lasting 3–4 days. The larvae and pupae are attacked by soil mites and Carabid larvae.

P. fuscipes becomes active in the spring, and from the beginning of March it multiplies rapidly, all stages being found in abundance. Under favourable conditions, several generations occur and it is most prevalent during May and June, months when the vesicular dermatitis caused by the beetles becomes most widespread, owing to the fact that they are attracted by artificial lights to enter dwellings in large numbers. Heavy rains during March-May wash away and drown numbers of the beetles and suffocate larvae and pupae by rendering the soil wet and impervious. In any case, the monsoon rains and the subsequent floods occurring from about the end of June render the species scarce during the rest of the year.

Conference of Governors of British East African Territories. Research Conferences. Conference on Tsetse and Trypanosomiasis (Animal and Human) Research held at Entebbe, 22nd to 25th November 1933.—Med. 8vo, 42 pp. Nairobi, 1934.

A brief account is given of the proceedings of a conference of workers on the problem of controlling trypanosomiasis and tsetse-fly in Uganda, Kenya and Tanganyika, convened by the Conference of Governors for the purpose of drawing up a co-ordinated programme for future research. The agenda comprised items suggested in the Report of the Second International Conference on Sleeping Sickness [*R.A.E.*, B **17** 92], those suggested by investigators in the East African Territories, and a discussion of the future of trypanosomiasis and tsetse-fly research in East Africa. A summary of the programme finally adopted is appended, together with an outline by Dr. G. Maclean of the methods used in Tanganyika Territory for the concentration of population as a measure for the control of sleeping sickness, and an account by C. F. M. Swynnerton of the work that is being carried out on the control of *Glossina* by the Tsetse Research Department in Tanganyika and by members of the Medical and Veterinary Departments in other territories in collaboration.

[Symes (C. B.) & Roberts (J. I.).] **Section of Medical Entomology.**—*Rep. med. Res. Lab. Kenya 1932* pp. 21–27. Nairobi, 1934.

The results of an experiment on the substitution of Paris green for oil carried out at Kisumu, Kenya, indicate that the control of Anopheline larvae has been at least equal to that obtained in previous years and the cost has been remarkably low, even though it was necessary to import a selected grade of lime for use as a carrier. Tests of oil and oil mixtures, which are not yet complete, indicate that the lethal effects of mineral oils on larvae are hastened by an increase of temperature, so that oils act more rapidly when exposed to the sun, but that the length of time during which they are effective is decreased. This action is only partly due to a quicker release and loss of volatile toxic vapours and probably results from a lowering of viscosity. The addition of a highly volatile fraction, such as kerosene, to fuel oil increases the toxicity during the first 36 hours only and appears actually to increase the surface tension and so reduce the spreading power of the mixture. It appears useless to combine such an oil with light fuel oils at a rate higher than 10 per

cent. Solar oil is superior in effect to the fuel oils tested, but not sufficiently so to compensate for the higher cost. There is little evident advantage in the addition of small quantities of solar oil to mixtures of kerosene and fuel oil, and the addition of large quantities is too costly, but as a substitute for kerosene in a mixture with fuel oil it is of value. Though oil used at rates of 3–12 gals. per acre kills the larvae, the films produced break up quickly, and where spraying is carried out every 7–10 days, 18–21 gals. is provisionally recommended.

Short notes are given on observations and experiments made with a view to discovering the tick concerned in the transmission of tropical typhus [*R.A.E.*, B **21** 107] and on work in progress in connection with the control of *Glossina palpalis*, R.-D.

The possibilities of the carriage of rats and fleas in cotton seed from Uganda were investigated, but the examination of large numbers of trucks of cotton seed, cotton lint in bales, etc., revealed no damage to the bags or seed by rats. Only one living example of *Mus* (*Rattus*) *rattus* was captured, and it harboured only one female of *Xenopsylla brasiliensis*, Baker. From white rats and guineapigs released in the trucks, 8 examples of *X. brasiliensis* were obtained. Laboratory tests showed that rats are poisoned by cotton seed and do not feed readily on it, so that there appears to be little danger of their occurrence in association with the stored seed. Preliminary experiments on transmission of plague from rat to rat by fleas appear to confirm the view that *X. cheopis*, Roths., and *X. brasiliensis* are the vectors [*cf.* **21** 13]. The fact that *Ctenophthalmus cabirus*, J. & R., and *Dinopsyllus lypusus*, J. & R., have occasionally transmitted plague experimentally cannot be accepted as proof that they do so in nature ; tests with large numbers of these species taken from field rodents during an epidemic of plague in Nairobi failed to demonstrate infection in them. Plague was successfully transmitted with comparatively small numbers of fleas, in one case with 5 examples of *C. cabirus*.

There was an increase during the year in the numbers of cases of infestation by *Cordylobia anthropophaga*, Grünb., first among field rodents, then among dogs and lastly in man. Species of *Paederus* have been recorded from many areas in Kenya. They are abundant during the period following the long rains (July and August) and seem to be most prevalent in the long grass bordering streams. A suspension of 7 examples of *P. crebrepunctatus*, Eppelsheim, painted on the forearm, produced a marked inflammatory reaction of the skin, accompanied by pains, headache and sickness. It is thought that these Staphylinids may be of some clinical importance where conjunctivitis and ulceration and opacity of the cornea are prevalent among native tribes.

Annual Report of the Government Entomologist for 1933.—*Annu. med. sanit. Rep. Uganda 1933* pp. 57–59. Entebbe, 1934.

Brief comments are made on a number of local Anopheline surveys carried out in Uganda during the year. Studies on the life-histories of *Anopheles gambiae*, Giles, and *A. funestus*, Giles, in experimental pools under conditions approaching their natural environment showed that the life-cycle from oviposition to adult emergence varied from 11 to 16 and from 20 to 21 days respectively. The interval between successive applications of oil should not therefore exceed 10 days, or

of Paris green (which has no effect on the eggs or pupae) 6 days. No mosquito breeding was observed in the experiment with the unshaded section of roof gutter, which was continued [*cf.* *R.A.E.*, B **22** 84]; *Aëdes aegypti*, L., bred freely in gutters under varying degrees of shade, but no Anopheline larvae were found.

From an examination of the fleas taken on rats caught chiefly in huts adjacent to those in which plague had occurred in rural areas of the Mengo district, it is concluded that, at least in parts of rural Buganda, *Xenopsylla brasiliensis*, Baker, is the principal vector of plague.

As this was practically the only flea found on *Mus* (*Rattus*) *rattus* in a store on the outskirts of Kampala, the predominance of *X. cheopis*, Roths., in the town must be confined to a limited area. The ground squirrel, *Euxerus erythropus*, was almost invariably infested only with *Ctenocephalides crataepus*, Jord., which appears to be specific to it, so that it is unlikely to prove a reservoir of plague.

Two local tsetse-fly surveys having particular reference to the distribution of *Glossina palpalis*, R.-D., are briefly described.

GIBBINS (E. G.). **Further Studies of Ethiopian Simuliidae.**—*Trans. R. ent. Soc. Lond.* **82** pt. 1 pp. 51–97, 1 map, 41 figs., 13 refs. London, 30th June 1934.

Descriptions are given of the larvae, pupae and adults of both sexes of Simuliids taken in Uganda in 1932, comprising seven new species as well as *Simulium dentulosum*, Roub., and *S. adersi*, Pom. [the species previously referred to by the author as *S. adersi*, Gibbins (*R.A.E.*, B **22** 44; *cf.* also **22** 84)], which is considered specifically distinct from *S. hirsutum*, Pom. [*cf.* **10** 106]. *S. hirsutum* var. *dubium*, Pom. [**10** 106] is also considered a distinct species. The breeding-place of each of the nine species is recorded. The degree of aeration of the water appears to be the most important factor, certain species being found only in water aerated to an extreme degree and others in cool sluggish streams where no aeration was perceptible, although doubtless a small amount of dissolved oxygen was present. The early stages were never observed in still water or in water that remained stationary for short periods. The temperature and illumination of the water and the presence of vegetation or of organic and inorganic matter were important secondary factors. The fact that *S. adersi* has been taken in traps designed to catch *Glossina* suggests a possible means of control for *Simulium*.

NIESCHULZ (O.), BEDFORD (G. A. H.) & DU TOIT (R. M.). **Investigations into the Transmission of Bluetongue in Sheep during the Season 1931/1932.**—*Onderstepoort J.* **2** no. 2 pp. 509–562. Pretoria, April 1934.

A very detailed account is given of experiments carried out in South Africa during 1931–32 on the transmission of blue-tongue disease of sheep by means of species of *Aëdes*. The mosquitos were fed in small wire cages covered with mosquito netting and fixed to clipped areas of the sheep's skin by pieces of tape attached to the surrounding wool. Three strains of the virus were used and 7 species of mosquitos, but definitely positive results were obtained only in 3 out of 46 experiments. In the first, 5 examples of *A. caballus*, Theo., injected about 18 hours after they had fed on an infected sheep induced the disease, showing that the manner in which the mosquitos were fed was efficient. In the second, 60 examples of *A. lineatopennis*, Ludl., injected into a

susceptible sheep 17–19 days after the infecting feed induced a typical fever reaction and complete immunity, and also clearly positive immunity in two subinoculations, showing that the virus can persist in this species for at least 17 days, although it appears from the negative results of other experiments with it that this is unusual. In the third, 15 examples of the same species re-fed after 14–15 days on a normal sheep induced a slight temperature reaction but no immunity ; the presence of the virus was, however, subsequently indicated by a marked temperature reaction accompanied by slight but typical clinical symptoms in a subinoculated sheep, which was also shown later to be totally immune. The other results were all doubtful or negative. Thus *A. lineatopennis* appears to transmit the disease, though whether it is an important, or merely an accidental, vector has not yet been ascertained.

Taylor (A. W.). **A Note on Mosquitos breeding in Tree-holes in Northern Nigeria.**—*Bull. ent. Res.* **25** pt. 2 pp. 191–193, 7 refs. London, July 1934.

Numerous species of mosquitos have been recorded as breeding in tree-holes in and near Lagos, Southern Nigeria, where the annual rainfall, which averages about 70 inches, is fairly evenly distributed throughout the year [*cf. R.A.E.*, B **14** 219 ; **16** 69, 92]. At Gadau, Northern Nigeria, however, the greater part of the annual rainfall, which averages only 25 inches, occurs from mid-June to mid-September, and during the dry season the humidity is extremely low [*cf.* **21** 129]. Although such conditions appeared to render the survival of tree-hole mosquitos almost impossible, observations were made during 1931 of 11 holes in different species of trees. No rainwater remained in the holes for longer than a few hours until the beginning of July, and from that time until they became dry during the second week in September, samples of water were taken at intervals and the larvae present were reared in the laboratory. A total of 9 species were found including, in addition to *Aëdes aegypti*, L., *A. luteocephalus*, Newst., and *A. simpsoni*, Theo., both of which are experimental vectors of yellow fever [**22** 29]. In January and February, after the grass fires which often scorch the topmost branches of the trees were over, collections of débris and scrapings were taken from the holes and placed in water so that any eggs present might hatch. Four species of *Aëdes* were reared, including *A. aegypti* and *A. simpsoni*.

Lewis (D. J.). **The Behaviour of the Larvae of Tsetse-flies before Pupation.**—*Bull. ent. Res.* **25** pt. 2 pp. 195–199, 1 pl., 18 refs. London, July 1934.

Laboratory observations on the behaviour of newly deposited larvae of *Glossina tachinoides*, Westw., and *G. morsitans submorsitans*, Newst., were carried out at Gadau, Northern Nigeria.

The following is taken from the author's summary and conclusions : In both species, the larva is slow in crawling and burrowing and often cannot burrow at all. It penetrates coarse sand more readily than fine, and fine sand more readily than wood ash, and burrows easily in fine sand with pebbles. In nature it probably always burrows eventually, unless attacked by predators or parasites to which its behaviour renders it vulnerable. Previous field work indicates that the depth to which

larvae burrow influences the effect of predators and parasites and sometimes of solar radiation on the puparia. Records of breeding-places suggest that larvae often crawl over hard soil to reach suitable places in which to burrow, and that unless the female fly, before depositing a larva, carefully selects such a place, the mortality due to other insects is probably high.

Freeborn (S. B.) & Zimmerman (E. C.). **The Males of *Leptoconops torrens*, Tns., and *L. kerteszi*, Kieff.**—*Bull. ent. Res.* **25** pt. 2 pp. 257–262, 4 figs., 4 refs. London, July 1934.

The territory near the rivers in the Sacramento and northern San Joaquin Valleys, California, has been severely infested each spring with hordes of fiercely biting "black gnats," which are blown by the winds over wide areas. In some seasons these Ceratopogonids constitute such a severe pest that agricultural work has to be suspended and even persons in towns remain indoors until nightfall. The authors describe the males of two species concerned, *viz.*, *Leptoconops torrens*, Tns., of which *L. carteri*, Hoffmann [*R.A.E.*, B **14** 218] is considered a synonym, and *L. kerteszi*, Kieff., from which var. *americanus*, Carter [**9** 132] is not believed to be distinct.

Nash (T. A. M.). **Advice on Tsetse Surveys and Clearings.**—8vo, 8 pp. Kaduna [Nigeria], Govt Printer, 1934.

In this brief and popular outline of the subject of tsetse-flies and their control by means of clearings, notes are given on the general appearance of *Glossina morsitans*, Westw., *G. tachinoides*, Westw., *G. palpalis*, R.-D., and *G. longipalpis*, Wied., which are the commonest species in Nigeria, on the habitats of the first three species, on the reason for making fly surveys and the method used, and on the types of clearing necessary under various conditions and the most satisfactory means of carrying out the work required.

Beeuwkes (H.), Bauer (J. H.) & Mahaffy (A. F.). **Yellow Fever Endemicity in West Africa, with special Reference to Protection Tests.**—*Amer. J. trop. Med.* **10** no. 5 pp. 305–333, 2 maps, 4 refs. Baltimore, Md, September 1930.

Beeuwkes (H.) & Mahaffy (A. F.). **The Past Incidence and Distribution of Yellow Fever in West Africa as indicated by Protection Test Surveys.**—*Trans. R. Soc. trop. Med. Hyg.* **28** no. 1 p. 39–76, 1 graph, 6 maps, 12 refs. London, 30th June 1934.

As studies on the incidence of yellow fever carried out in Nigeria in 1929 and described in the first paper proved of great interest, the work was continued there and to a limited extent in the Gold Coast and Sierra Leone in the following year. The demonstration of the susceptibility of white mice to the virus was followed by the development of a relatively simple and practicable protection test with these animals that has made possible the extensive investigations described in the second paper, which were begun in 1931.

The following is taken from the authors' summary: A protection test survey covering the examination of 7,580 sera collected in 181 towns in eight colonies has demonstrated that yellow fever is far more prevalent in West Africa than was previously supposed; great numbers of cases occur both in the coastal regions and in the interior, and approximately 25 per cent. of all specimens examined gave positive results.

Practically the entire area covered by the survey has been demonstrated to be infectible, and positive sera have been obtained even from natives on the Jos Plateau at an elevation of over 4,000 feet. Work in the French colonies north of Nigeria indicates that epidemics occur in that semi-arid region but that the Sahara Desert forms an effective barrier against infection. Yellow fever is rarely recognised in the native, and the relatively few cases reported in Europeans give no indication of its incidence or distribution. The findings have confirmed the opinion that an endemic area of yellow fever exists in south-western Nigeria, but it has not been possible to delimit this area, which may extend westward into neighbouring colonies, or definitely to exclude endemicity in some other regions. Meteorological conditions in northern Nigeria would, however, seem to be unfavourable for the permanent existence of yellow fever infection [*cf. R.A.E.*, B **21** 128], and this probably applies to the far interior of West Africa in general. Age-group studies in cities in the endemic area have shown that the disease in endemic cities is not confined to children, but that the percentage of immunes increases gradually up to old age and that some persons escape throughout life. It has also been shown that extensive epidemics occur in endemic areas. All these findings are of importance in connection with the formulation of quarantine regulations, especially for air services. The great value of piped water supplies and effective sanitary services in reducing or eliminating yellow fever infection was brought out in several of the more important places studied and especially in Freetown, Sierra Leone, and in some of the coastal cities of the Gold Coast and Nigeria.

Duke (H. L.), Mettam (R. W. M.) & Wallace (J. M.). **Observations on the Direct Passage from Vertebrate to Vertebrate of recently isolated Strains of *Trypanosoma brucei* and *Trypanosoma rhodesiense*.**—*Trans. R. Soc. trop. Med. Hyg.* **28** no. 1 pp. 77–84, 29 refs London, 30th June 1934.

In the course of this paper on experiments in Uganda, the literature referring to the direct transmission of trypanosomes by various species of flies is briefly reviewed, and a short account is given of the transmission of *Trypanosoma rhodesiense* from an infected to a healthy monkey by the interrupted feedings of *Stomoxys* [*cf. R.A.E.*, B **22** 113]. To determine whether fleas can act as mechanical vectors of *T. brucei*, an infected and a healthy dog, both infested with *Ctenocephalides* (*Ctenocephalus*) *canis*, Curt., were kept in a small kennel, but although fleas were transferred daily from the infected to the healthy animal, no signs of illness were observed in the latter during a period of 6 weeks. Negative results were also obtained when fleas from the infected dog were inoculated or administered by mouth to two other healthy dogs. Attempts to infect healthy oxen by injecting them with engorged ticks or the faeces of lice (*Haematopinus eurysternus*, Nitz., and *Linognathus vituli*, L.) that had fed on infected oxen were unsuccessful.

Vickers (W. J.), West (G. F.) & D'Netto (S. G.). **Economy in Large Scale Antimalarial Control in Kuala Lumpur, Federated Malay States.**—*Trans. R. Soc. trop. Med. Hyg.* **28** no. 1 pp. 85–99, 18 refs, 1 chart. London, 30th June 1934.

The authors describe the measures against mosquito larvae that were in force until recently at Kuala Lumpur, where *Anopheles maculatus*,

Theo., and *A. umbrosus*, Theo., are the two chief vectors of malaria. In view of the economic depression, tests were carried out over a period of 12 months of methods designed to effect a saving in expenditure while maintaining the existing standard of public health. These conditions were most satisfactorily fulfilled by a modified method of oiling, in which a small amount of oil is released from a sprayer and spread by means of brushing [*cf. R.A.E.*, B **22** 149]. The organisation of personnel, the technique employed and the results obtained are described in detail. The success of this method, by means of which the cost of the oil was reduced by 50 per cent., has already been briefly reported [*loc. cit.*].

ROBIN (L. A.). **Résultats pratiques de la prophylaxie antipalustre en général et de la lutte antilarvaire en particulier sur quelques exploitations agricoles en Indochine.**—*Bull. Soc. méd.-chir. Indochine* **12** no. 4 pp. 378–401, 4 pls., 8 graphs. Hanoi, 1934. **Ce qu'il faut entendre par " assainissement spontané " de plantations en Indochine méridionale. De la prémunition chez l'adulte.** *T.c.* pp. 402–421, 3 graphs.

In the first paper, the author discusses the factors by means of which the value of anti-malarial measures undertaken on plantations in the malarious zone of southern Indo-China may be estimated, and describes the conditions in a number of villages connected with plantations in Cochin China and Cambodia and in a town in southern Annam, both before and after the institution of measures against Anopheline larvae, to show the many advantages and the rapidity of effect of such measures used in conjunction with the administration of prophylactic quinine, which is insufficient alone.

In the second, he shows by other examples that employees who remain in hyperendemic areas on plantations, where prophylactic quinine is given but no anti-larval measures are undertaken, undoubtedly become immune to a certain extent after about five years. Provided that the influx of susceptible labour from other areas is not too large in proportion to the total personnel, the health of the plantation from this time onwards appears to improve. This condition is, however, unstable ; the lowering of resistance of the labour force from any cause may bring about a rise in the sickness rate, and the spleen rate is always high, as are the also infant mortality and the morbidity among young children.

JAMES (S. P.). **Renseignements sur la fièvre jaune reçus pendant les six mois se terminant au 31 mars 1934.**—*Bull. Off. int. Hyg. publ.* **26** no. 6 pp. 1048–1056, 1 fldg map. Paris, June 1934.

BOYÉ (—). **Les recherches concernant le test de protection contre la fièvre jaune en Afrique équatoriale française et au Cameroun.**—*T.c.* pp. 1061–1066.

MOUCHET (R.), VAN HOOF (L.), DUREN (A.), FONTANA (L.), CLAREBOUT (G.), HENRY (E.) & HENRARD (C.). **Résumé de l'enquête sur l'endémicité amarile au Congo belge en 1932–1933.**—*T.c.* pp. 1067–1071.

The first paper includes a reference to observations by C. B. Symes of the carriage of mosquitos in aeroplanes from the Sudan to Kenya. Of 30 aeroplanes examined at Kisumu and Nairobi, 18 harboured examples of *Anopheles* and 12 of *Culex* (generally 2–6, but

once, after a forced landing, as many as 23) in the passenger saloon or the compartment separating this from the pilot's cabin. Some Tabanids were also found, but no examples of *Aëdes aegypti*, L. Sprays or other control measures have apparently not yet been used in aeroplanes in this part of Africa.

Reference is also made to the discovery, by means of protection tests with mice [*cf. R.A.E.*, B **22** 173], of latent yellow fever among natives in Uganda and the southern provinces of the Anglo-Egyptian Sudan (Bahr-el-Ghazal and Mongalla), but not in the more northerly ones. A map shows the distribution of yellow fever in Africa in the clinical and latent forms. The second and third papers give the percentages of infection obtained in similar surveys in French Equatorial Africa, Kamerun and the Belgian Congo.

Papers noticed by Title only.

Abraham (R.). **Das Verhalten der Spermien in der weiblichen Bettwanze (*Cimex lectularius* L.) und der Verbleib der überschussigen Spermamasse.** [The Behaviour of the Sperm in the female Bed-bug and the Disposal of superfluous Sperms in it.]—*Z. Parasitenk.* **6** no. 5 pp. 559–591, 17 figs., 22 refs. Berlin, 21st July 1934.

Patton (W. S.) & Cushing (E. C.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Genera of the Subfamily Calliphorinae based on a comparative Study of the Male and Female Terminalia. The Genus *Calliphora* Robineau-Desvoidy (*sens. lat.*)** [Part I.].—*Ann. trop. Med. Parasit.* **28** no. 2 pp. 205–216, 11 figs. Liverpool, 12th July 1934. **The Genus *Chrysomyia* Robineau-Desvoidy (*sens. lat.*)** [Part II.].—*T.c.* pp. 217–223, 5 figs. [*cf. R.A.E.*, B **22** 120].

Séguy (E.). **Contribution à l'étude des mouches européennes du genre *Lucilia* R.-D.** [Keys to male and female adults and general anatomy of adult, pupa and larva.]—*Ann. Sci. nat.* (10) **17** pp. 283–288, 13 refs. Paris, 1934.

Vigueras (I. P.). **Sobre un nuevo hospedero de *Ornithodoros marginatus* Banks, 1910.** [On a new Host (the Bat, *Nycticeius cubanus*) of *Ornithodorus marginatus* in Cuba.]—*Rev. Univ. Habana* Sep. no. 3 p. 127, 3 refs. Havana, 1934.

Vigueras (I. P.). **Descripción de la hembra de *Amblyomma albopictum*.** [Description of the Female of *A. albopictum*, Neum.]—*Rev. Univ. Habana* Sep. no. 3 pp. 128–129, 5 refs. Havana, 1934.

Stone (A.). **Notes on *Bolbodimyia* and *Himantostylus* with a new Species (Diptera, Tabanidae).** [*B. nigra*, sp. n., from Ecuador.]—*Rev. Ent.* **4** fasc. 2 pp. 190–192. Rio de Janeiro, 27th June 1934.

Schilling (S. C.) & others. **Immunisation against Trypanosomiasis.**—*E. Afr. med. J.* **11** no. 3 pp. 83–88. Nairobi, June 1934. [See *R.A.E.*, B **22** 96.]

A Survey of the Househaunting Mosquitoes of Freetown and Kissy.—*Rep. med. sanit. Dep. Sierra Leone 1932*, pp. 74–77, 7 refs. Freetown, 1934. [*Cf. R.A.E.*, B **20** 279.]

MARTIN (P. H.). **Annual Report of the Malaria Advisory Board (Federated Malay States) for the year 1933.**—Med. 8vo, 16 pp. Kuala Lumpur, 1934.

A further instance of subsoil drainage by means of bamboo pipes is described [*cf. R.A.E.*, B **21** 254]. The pipes after being laid were lightly covered with fine brushwood and the drains filled in. Those laid at depths of 2½–4 ft. worked satisfactorily, whereas others laid at 2 ft. and in a sharp curve were not so successful. The bamboos, which were laid in a semi-green condition, will probably last 2-3 years, but even if they have to be replaced yearly the cost of the drains will be less than that of oiling. This method should therefore be of use, particularly where the skilled supervision required for oiling is not readily available. Experiments were carried out to test reports that drinking water contaminated with oil was a common cause of death in fowls, but although the birds used were given oil in greater quantities and more regularly than they would be likely to obtain it under natural conditions, they were not seriously affected. A sub-committee reporting on the suitability of subsoil drainage as an anti-larval measure on rubber estates stated that, although the designing and laying of such systems needs expert advice and the upkeep is more costly than in cleared areas, the knowledge required for their upkeep could be acquired by estate officers, and, provided that such supervision were available, there was no reason to suppose that such drains would not be as successful as they are elsewhere.

Experiments to test the efficacy in the lowland hills of Selangor of the method of sluicing used as a means of larval control in the Cameron Highlands [**21** 66] did not give satisfactory results. Considerable modification and strengthening of the gates originally recommended were found necessary, and still further improvement would be essential for all but experimental purposes. The installation of the gates and the construction of serviceable reservoirs presented many difficulties, owing to the friable nature of the soil and the amount of silt. From the present findings, it appears doubtful whether the use of sluice gates in the ravines of lowland hills would be less costly than oiling, particularly as some supplementary method of larval control is necessary for the heads of the ravines and for areas above the level of the flushing water. Moreover, efforts to control larvae in the experimental ravines have not so far been successful. In two experiments to determine the length of the life-cycle of *Anopheles maculatus*, Theo., 2 adults emerged 9 days after oviposition in one case, and in the second case 10 adults took an average of 13 days for development.

The economy effected at Kuala Lumpur by the brush method of oiling is discussed [*cf.* **22** 174].

GATER (B. A. R.). **Aids to the Identification of Anopheline Larvae in Malaya.**—Med. 8vo, 160 pp., 187 figs. Singapore, Govt S.S. & Malar. adv. Bd F.M.S., 1934. Price $1.

Keys are given to the larvae of the species of *Anopheles* occurring in the Malaysian sub-region and Siam, followed by brief descriptions, including notes on breeding-places [*cf. R.A.E.*, B **17** 163] and the relation of the adult to the transmission of malaria [*cf.* **16** 41 ; **19** 163]. These are preceded by a general account of the external and internal anatomy and of the bionomics of Anopheline larvae, together with notes on collecting and rearing, preserving and mounting, and making

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larval surveys, and a discussion on nomenclature, classification and the use of keys. In the first appendix, details are given of the equipment required for identifying larvae, and in the second, lists of the Anophelines recorded from Siam, Borneo, Java and Sumatra, special type in the index showing those that occur in the Malay Peninsula.

Robertson (R. C.) & Hu (S. M. K.). **Mosquito Control. An Entomological Field Research Station for Mosquito Study in the Shanghai District.**—*China J.* **20** no. 6 pp. 344–356, 8 pls., 5 figs. Shanghai, June 1934.

An account is given of a mosquito survey in the district of Shanghai and of the work carried out in 1933 in a field laboratory and in the Lester Institute in Shanghai. An area containing a wide variety of larval breeding-places was mapped, and data collected daily were considered in relation to those obtained from the examination of adult mosquitos. Of the 12 species found, a key to which is given, the only Anopheline was *Anopheles hyrcanus* var. *sinensis*, Wied. From experimental infection of the various species and from dissection of mosquitos from houses in rural areas, the chief carrier of filariasis appeared to be *Culex pipiens* var. *pallens*, Coq., which was very common.

Hart (R. W.) & Pelikan (E. R.). **Life Span of Fleas without a Host under normal Atmospheric Conditions occurring in Manila.**—*Publ. Hlth Rep.* **49** no. 24 pp. 699–711. Washington, D.C., 15th June 1934.

Japanese sanitary authorities have attributed the occurrence of plague in or near Osaka to the agency of free-living fleas introduced on bales of cotton from India in two instances in which they believed that no infected rodents were present. Since cargo of a similar nature is frequently transported in rat-proofed ships from Indian ports to the Philippines, the investigations described were undertaken to determine whether plague was likely to be introduced in such a manner unless the cargo were treated for the destruction of fleas before discharge. As the voyage from the nearest Indian port occupies at least 12 days, experiments were carried out to discover whether fleas without a host could live for this time under the comparatively high temperatures and humidity that normally occur practically throughout the year in the Manila district. Literature on the longevity of fleas is briefly reviewed. The species used included *Xenopsylla cheopis*, Roths., *X. astia*, Roths, *Ctenocephalides* (*Ctenocephalus*) *canis*, Curt., and *C.* (*C.*) *felis*, Bch. Under normal atmospheric conditions, the longevity varied little from month to month, the average ranging from 2·3 days in November to 1 day in April–May, and the maximum being 5 days. In containers in which the humidity was raised, the average was 3·7 days during August–September and 4·5 in October, the maximum being 12. Records of the temperatures and humidity on ships plying between Calcutta and Manila during December–March and May show that they are within the range occurring in Manila. It is therefore concluded that, although the flea would not ordinarily live longer than 5 days, when sufficient rain occurs to raise the percentage of humidity in the holds it may possibly survive for 12 days. Thus, the possibility of plague-infected fleas arriving at Manila from India may exist, though it is very slight.

Corcuff (—). **Etude sur les diverses variétés de puces recueillies à Salé (Maroc) au cours d'une année.**—*Bull. Inst. Hyg. Maroc* 1933 no. 4 p. 5. (Abstr. in *Bull. Off. int. Hyg. publ.* **26** no. 6 pp. 1106–1107. Paris, June 1934.)

A rat-flea survey was carried out at Salé, a native village in Morocco, from March 1932 to February 1933. Of 450 rats, comprising *Mus* (*Rattus*) *norvegicus* (*decumanus*), *M.* (*R.*) *rattus* and its variety *alexandrinus*, only 174 were infested (with an average of 4·367 fleas). The percentages of the different species found were : *Xenopsylla cheopis*, Roths., 43·68 ; *Pulex irritans*, L., 1·05 ; *Ceratophyllus fasciatus*, Bosc, 9·47 ; *Leptopsylla* (*Ctenopsylla*) *segnis*, Schönh. (*musculi*, Dugès), 0·26 ; *Ctenocephalides* (*Ctenocephalus*) *felis*, Bch., 0·78 ; *C.* (*C.*) *canis*, Curt., 0·52 ; *Echidnophaga gallinacea*, Westw., 44·07 ; *Stenoponia* (*Hystrichopsylla*) *tripectinata*, Tirab., 0·13. The relative abundance of *E. gallinacea* suggests that its importance as a vector of plague may not be so negligible as has been supposed. The author considers that the high atmospheric humidity and low temperatures of the coast reduce the risk of an epidemic at Salé, the optimum for *X. cheopis* being 20–26°C. [68–78·8°F.].

A trap for fleas is described consisting of a zinc dish containing oil and a night-light and surrounded by a zinc hoop with a cutting edge enabling the dish to be embedded in loose soil. Fleas appeared to be more attracted to this light than to man, and two such traps operated from 8th April 1932 to 25th February 1933 caught 7,334 of them.

Dyson (J. E. B.) & Lloyd (Ll.). **Remarks on the Flies breeding in the Bacteria Beds at the Knostrop Sewage Works, Leeds.**—*Surveyor* **84** no. 2178 pp. 335–337, 7 refs. London, 20th October 1933.

The authors suggest that the increased production of ammonia associated with the presence in sewage beds of *Hypogastrura* (*Achorutes*) *viatica*, Tullb. [*cf. R.A.E.*, B **9** 56] is due to stimulation of the bacteria by the feeding of the Collembola, and that similar benefit may be derived from the presence of larvae of other insects. The scouring of the beds by larvae is certainly beneficial, but the breeding of large numbers of flies may constitute a nuisance to local residents. None of the species breeding in sewage beds, however, is known to visit human food. Conditions limiting the possible fauna of the beds are the alternation of flooding and drying and the exclusion of bright light and so of plant growth containing chlorophyll. On the other hand, the temperature is equable (the maximum range in the beds studied being 37–65°F.), natural enemies are scarce and the habitable deposit is much deeper than that occurring in nature.

A preliminary study of the insect fauna of sewage beds at Leeds was conducted by trapping emerging flies by means of wooden frames (1 ft. × 1 ft. × 4 ins.) covered with linoleum ; a hole 1 inch in diameter was cut in the frame, and a glass jar containing some absorbent paper was fixed over it, a paper cone being used to prevent the escape of the flies. This proved effective, except that the light was sometimes too strong to attract Psychodids. Two species of *Psychoda* were abundant, but not a serious nuisance [*cf.* **21** 243 ; etc.] ; *P. severini*, Tonn., was relatively rare in the hot, dry weather of August 1933, when especially large numbers of *P. alternata*, Say (*sexpunctata*, Curt.) were present which, however, were readily dispersed by slight wind.

The chief flies trapped were Chironomids. Of these, the commonest was *Spaniotoma* (*Limnophyes*) *minima*, Mg., of which more than 1,000 emerged per sq. ft. in the last week of August. The eggs are laid in small clusters embedded in mucus. *Metriocnemus hirticollis*, Staeg., and *M. longitarsus*, Goet., which are less resistant to drying, were most numerous in midwinter. The eggs are laid in mucus masses just below the surface stones, and the larvae are washed down into the lower part of the bed, returning to within a few inches of the surface to pupate. *Chironomus dorsalis*, Mg., and *Tanytarsus atrofasciatus*, Kieff., were rarely trapped over the beds, but bred freely in the aeration channels. Other Diptera taken include *Limosina* sp. and *Spathiophora* sp., the latter being predacious. The only blood-sucking fly was *Culicoides pulicaris*, L., which was not common.

It is probable that, whatever stony material was used for filling the beds, enough grazing organisms would establish themselves to keep them in working order. To check excessive fly breeding, the best would probably be smooth pebbles, screened so as to prevent gravel compacting in the depths of the bed. The dispersing power of the wind should be utilised by not allowing shady groves of trees near the beds. Sheet spraying is preferable to drop spraying, as some emerging flies are probably drowned by the steady stream of descending sewage. The potential emergence of flies from the dry parts of the beds is slight compared with that from the wet parts. The effect on the fly population of the resting periods of the beds deserves more systematic study.

MAYER (K.). **Beitrag zur Kenntnis von Fosfolon als Schädlingsbekämpfungsmittel.** [A Contribution to the Knowledge of Fosfolon as a Fumigant.]—*Z. GesundhTech. Städtehyg.* **26** no. 7 pp. 377–384, 1 fig., 3 refs. Berlin, July 1934.

In experiments with Fosfolon, a German proprietary fumigant in the form of a powder [mainly composed of calcium phosphide and calcium carbide, which when exposed to moisture generates acetylene and the intensely poisonous hydrogen phosphide gas (*cf. R.A.E.*, A **21** 388)], it was found that bed-bugs (*Cimex lectularius*, L.) survived exposure for 24 hours to a concentration of 1–2 oz. per 100 cu. ft., but that they no longer sucked blood. Some oviposited, but the eggs were not viable. The eggs were not all destroyed even after 48 hours, and the bugs that hatched were able to suck blood. Eggs laid at 30°C. [86°F.] were more resistant than those laid at 25°C. [77°F.]. Eggs previously cooled on ice were also much more sensitive. The tropical bug, *Rhodnius pictipes*, Stål, was not greatly affected by exposure to 1–2 oz. per 100 cu. ft. for about 20 hours. The nymphal period of both species was prolonged by fumigation.

PETTIT (R. H.). **Reports of the Entomology Section for the Years ended June 30th, 1931–1933.**—*Rep. Mich. St. Bd Agric. 1931*, reprint 22 pp., 17 figs.; *1932*, reprint 25 pp., 29 figs.; *1933*, reprint 12 pp., 12 figs. East Lansing, Mich., 1931–33. [Recd. 20th July 1934.]

The larvae of *Cephenomyia phobifer*, Clark, were reported from the nose and throat of wild deer in Michigan. *Gryllus domesticus*, L., appeared in houses in the State for the first time in 1932. A 25 per cent.

pyrethrum powder was employed successfully against *Linognathus* (*Haematopinus*) *vituli*, L., *H. eurysternus*, Nitzsch, and *Bovicola bovis*, L. (*Trichodectes scalaris*, Nitzsch) on cattle and *Melophagus ovinus*, L., on sheep.

Bogliolo (L.). **Studi sulle leishmaniosi. I. Lo stato attuale delle conoscenze sulla trasmissione delle leishmaniosi.** [The present State of Knowledge on the Transmission of Leishmaniasis.]—*Ann. Med. nav. colon.* anno **40** vol. 1 no. 3–4 pp. 139–213, 204 refs. Rome, 1934. (With a Summary in German.)

From this critical review of the more important literature, the author concludes that the precise method of transmission of the various forms of leishmaniasis is as yet unknown.

Bruce (W. G.). **Observations on Relapsing Fever following Bites by *Ornithodorus turicata* Dugès in a Texas Cave.**—*J. Kansas ent. Soc.* **7** no. 3 pp. 87–89, 4 refs. McPherson, Kans., July 1934.

In the autumn of 1930, six out of seven men who became infested with ticks in exploring a cave in central Texas developed relapsing fever in less than two weeks. The author, who entered the cave in December, was bitten by a few examples of *Ornithodorus turicata*, Dug., large numbers of which occurred on the floor and walls in the far recesses of the cave. He developed fever on the seventh day. Some of the ticks from the cave were fed on a guineapig, which contracted fever in about 10 days but recovered in about a fortnight. As the infested cave was inaccessible to goats, sheep or cattle [*cf. R.A.E.*, B **19** 116], it is probable that wild animals such as foxes and rodents serve as hosts for the ticks. Moreover, they may be transported from one locality to another by attaching themselves to buzzards, which frequent caves.

Mail (G. A.). **Mosquito Control in Montana.**—*Circ. Montana agric. Exp. Sta.* no. 143, 13 pp., 4 figs. Bozeman, Mont., October 1933. [Recd. July 1934.]

After giving a brief general account of the life-history and habits of mosquitos occurring in Montana, the author discusses their natural enemies and methods for their control. Breeding occurs chiefly in temporary collections of water, such as rain pools, seepage water in ditches, and borrow pits. The amount of precipitation in conjunction with temperature determines the abundance of mosquitos in most districts. Where the chief breeding-places are pools left by receding river floods, the snowfall in the mountains governs the rise of the rivers and consequently the extent of the flooded areas. In semi-arid regions, lack of rainfall may result in a larger number of mosquitos, owing to the necessity for more extensive irrigation [*cf. R.A.E.*, B **17** 215]. High temperatures induce rapid larval development, but may also promote more rapid evaporation of water from temporary pools. High temperatures during a wet season constitute ideal conditions for the multiplication of mosquitos.

Mosquitos are so prolific in Montana that, although natural enemies undoubtedly act as a check, their combined effect cannot be considered of value from an economic standpoint.

Drainage and filling are recommended as the most satisfactory measures for eliminating breeding near centres of population. In irrigated districts of northern Montana, the flood system is practised,

and water is allowed to flow on to a diked field of 40–80 acres to a depth of 6–12 inches. In such shallow water, which becomes very warm, the development of mosquitos from egg to adult may occupy as little as 8 days. Drainage of the field after 5 days would carry the half-grown larvae into the main ditch and out of the region, whereas if the water is allowed to remain until it all soaks into the heavy clay soil, mosquitos will emerge in enormous numbers over several acres at a time. Rank growth of willows and shrubs in swamps should be cut and burnt, as it affords the necessary shelter for many species of mosquitos, prevents rapid drying up of water and renders oiling difficult. Any temporary standing water with vegetation on the bottom that cannot be economically drained should be oiled. Satisfactory results were obtained in 1928–30 with an oil with the following specifications: gravity A.P.I. 35, flash point 210°C., viscosity at 100°C. 34, sulphur content 0·906 per cent. As very young larvae do not come to the surface for air so frequently as the older ones, the use of an oil that evaporates rapidly on water containing young larvae might not effect a satisfactory kill. For the use of campers in tents or cabins, fumigation with a tablespoonful of pyrethrum placed on a fireproof receptacle, and allowed to smoulder has been found by the author to be effective in stupefying the mosquitos; the odour is not unpleasant, and this material is relatively cheap and readily obtainable. For screens, the number of meshes should not be less than 16 to the inch; much of the material in common use has 12 meshes to the inch, which is too coarse to afford protection against many of the small mosquitos and biting midges. The treatment of buildings and the use of repellents is briefly mentioned [see next abstract].

Mail (G. A.). **The Mosquitoes of Montana.**—*Bull. Montana agric. Exp. Sta.* no. 288, 72 pp., 18 figs., 23 refs. Bozeman, Mont., March 1934. [Recd. July 1934.]

Although in Montana mosquitos are not concerned in the transmission of disease, they are of great economic importance in other ways. In many parts breeding has been reduced by drainage and cultural practices, but in certain areas the introduction of irrigation has created ideal conditions for the development of mosquitos in such large numbers that they seriously affect agricultural operations and are a constant source of irritation to those working out of doors during the mosquito season. Horses become restive and unmanageable, the milk yield of cows is reduced by 30–40 per cent., stock for fattening will not put on flesh, egg production is lowered and fowls may even be killed. In sections where Mexican contract labour is used in sugar-beet fields, the workers often refuse to go out when the insects are on the wing, and in certain regions these pests are so abundant during early summer that land values are seriously affected.

After dealing briefly with the methods used for collecting and rearing mosquitos, the author gives a list showing the systematic position and relative abundance of the 40 species occurring in Montana. Only two species of Anophelines have been recorded, *Anopheles punctipennis*, Say, which is rare, and *A. maculipennis*, Mg., which is fairly common; neither is of importance. Keys to the genera and species of adults and to the species of larvae are followed by notes on the distinguishing characters, distribution, life-history and economic importance of each species. Some general observations on the feeding and oviposition of

some of the species collected and on the resistance of eggs to immersion and desiccation are reported, together with a detailed account of observations and experiments on *Aëdes vexans*, Mg.

Biological control and the use of oiling are discussed [see preceding abstract]. From experiments, of which the details are given, it is concluded that none of the five derivatives of salicylic acid tested as mosquito repellents showed sufficient promise as a protection for cattle to warrant further study, although at least three proved superior to proprietary substances advertised as a protection for man. Methyl-monobromosalicylate retained its repellent property for 5 hours, but thereafter quickly lost it; monobromosalicylate repelled 100 per cent. for 3 hours and remained highly repellent for longer than methyl-monobromosalicylate. A certain amount of success was obtained when creosote was sprayed as a repellent on stalls in a shed.

Mönnig (H. O.). **Veterinary Helminthology and Entomology. The Diseases of Domesticated Animals caused by Helminth and Arthropod Parasites.**—Med. 8vo, xvi+402 pp., 12 pls., 264 figs. London, Baillière, Tindall & Cox, 1934. Price £1 10*s*.

This textbook for the use of veterinary students and practitioners deals with the more important worm and Arthropod parasites of man and of the commoner domestic and fur-bearing animals of all countries. The first section deals with the subject of parasitology in general, the second with the technique of collecting and preserving parasites and the methods used in diagnosing their presence, and the third and fourth sections with the different helminth and Arthropod parasites respectively. At the end, lists are given of the parasites under their hosts, but temporary parasites such as blood-sucking Diptera are not included, and ticks are recorded only under those hosts that are most important or to which they transmit disease.

Wigglesworth (V. B.). **Insect Physiology.**—Fcap 8vo, x+134 pp., 13 figs., 297 refs. London, Methuen & Co. Ltd., 1934. Price 3*s*. 6*d*.

In this general account of the physiology of insects based on original work and on a study of nearly 2,000 publications (of which only the more recent ones have been included in the bibliography), the author has endeavoured to meet the demand for increased knowledge on this subject on the part of the economic entomologist. Descriptions are given of the major functions of the organs and tissues and the mechanisms by which they are co-ordinated to serve the purpose of the insect as a whole, various points being illustrated by reference to particular genera or species. Separate chapters deal with the integument, respiration, the circulatory system and the blood, digestion, excretion, nutrition and metabolism, reproduction and growth, and the nervous system, sense organs and behaviour.

Ratcliffe (F. N.). **Sheep-maggot Flies in Scotland.**—*Scott. J. Agric.* **17** no. 3 pp. 249–260, 3 pls. Edinburgh, July 1934. (With an Introduction by J. Ritchie.)

This is a preliminary report of an investigation by the author and G. Morison on the sheep blow-fly problem in Scotland, which was unusually serious in the hot summer of 1933. Infestation was often

particularly heavy immediately after showery periods, probably because the wetting of the fleece followed by hot weather had promoted the bacterial rotting that attracts ovipositing females [*cf. R.A.E.*, B **22** 153]. Records of flies caught near Aberdeen in traps baited with liver show that early in the summer *Calliphora erythrocephala*, Mg., was much commoner than *Lucilia sericata*, Mg. (which did not appear before 7th June), but the prevalent belief that the former species is the chief cause of "strike" before July may be simply due to the fact that maggots found at this season appear larger, as they are generally not observed till they are almost full-grown. Observations showed that sheep attacked in June are nearly always scouring and dirty ewes, the maggots being found near the tail, where they cause relatively little irritation. Later, after the ewes are clipped, lambs become increasingly infested, mostly on the body, a favourite spot being over the ribs, just where the fore-feet reach when the animal lies down. There is presumably plenty of nourishment in the thick fleece of an unclipped ewe, so that the maggots can get all they need by feeding over the surface of the skin, whereas in the shorter wool of the lambs, which have not a winter's accumulation of grease and sweat, they tend to break the skin almost at once. There is a record of infestation in 1933 as late as November.

In the laboratory, individual females of *L. sericata* laid up to 2,000 eggs, sometimes as many as 250 in a batch. In nature, batches probably seldom exceed about 100. Some have been found actually against the skin of a fully fleeced sheep. They sometimes hatched in a little under 24 hours, and at the temperature of a sheep's skin the larvae were able to complete their growth in 48 hours.

The trap records appear to show that the flies follow the sheep, although the number of the flies in proportion to instances of "strike" is so large that their reason for doing so is not obvious. Of the flies trapped in normal pastures, about half belonged to the genus *Lucilia*, but of these only about one-tenth were *L. sericata*, the remainder being *L. caesar*, L., which does not attack sheep. *L. sericata* is attracted by sunlight [*cf.* **22** 13] and shelter from wind, so that infestation is generally heaviest in fields protected by walls or woods (though not under the shade of trees) or in bracken patches, and lightest on open uplands. A questionnaire to farmers revealed the fact that it is generally (though unevenly) distributed throughout Scotland except in the extreme north, where, however, it appears to be spreading. It is heaviest in the south, but seems to be affected by many local factors that are not understood. One farmer reported that swallows had helped to control the flies, and several that infestation was associated with rabbits or with starlings, one having found egg-batches near starlings' droppings on a clean sheep. Estimates of the losses due to infestation varied widely, but it is evident that the total loss to Scottish farming is considerable.

It is pointed out that dipping is rarely effective in preventing infestation for more than a fortnight, and that the use of a dirty dip may even make the sheep more attractive to the flies. Infested sheep should be treated if possible before the skin is broken ; after this, an arsenical or other poisonous dressing cannot safely be used. The wool should be clipped for an inch or two round the centre of infestation, as the larvae often migrate for this distance, and larvae removed from the fleece should be killed, as half-grown ones are capable of reaching the adult stage off the sheep [*cf.* **22** 132]. Dressings recommended are carbolic acid (at not more than 4 per cent. strength) dissolved in water or whale

oil and a 5 per cent. solution of copper or zinc sulphate in water. The use of excessively strong dressings has often led to irritation of the skin and so to re-infestation.

VALENTINE (W.). **The Warble Fly from the Farmers' Aspect.**—*Vet. J.* **90** no. 7 pp. 299–300. London, July 1934.

The author gives figures showing the loss sustained by farmers in Britain owing to the lowering of the grade of hides damaged by warble-flies [*Hypoderma*]. The losses incurred in the case of beef are more difficult to assess, but may amount to $\frac{1}{4}d.$ or even $\frac{1}{2}d.$ per lb. on the whole carcase, and an even greater loss is sustained through buyers withholding their competition when cattle with obviously warbled hides are being sold alive. A still further loss that cannot be computed is that arising when cattle, particularly those for fattening, are worried by the adult flies.

THOMPSON (G. B.). **The Parasites of British Birds and Mammals. II. —Records of Ixodoidea (Ticks).**—*Ent. mon. Mag.* **70** no. 844 pp. 204–207, 3 refs. London, September 1934.

Among the ticks recorded is *Ixodes ricinus*, L., from a siskin (*Carduelis spinus*) and a sparrow-hawk (*Accipiter nisus*) in Scotland. The flea, *Ceratophyllus gallinae*, Schr., was also found on a siskin.

CUTHBERTSON (A.). **Biological Notes on some Diptera in Southern Rhodesia.**—*Proc. Rhod. sci. Ass.* **33** pp. 32–50. Salisbury, S. Rhod., May 1934.

The flies recorded from Southern Rhodesia [*cf. R.A.E.*, B **21** 222; etc.] include the following Muscoids: *Musca fasciata*, Stein, both sexes of which were abundant during April–May at bleeding cuts and sores in cattle, horses and natives; *Muscina stabulans*, Fall., larvae of which have been found in decaying potato tubers and dead insects, being usually associated with *Fannia canicularis*, L., and *Sarcophaga nodosa*, Engel, which last also caused myiasis of the human ear; *Calliphora parasacra*, Speiser (*croceipalpis*, Jaennicke), which is widely distributed in the highlands of the eastern districts, both sexes occurring in houses; *Chrysomyia inclinata*, Wlk., which appears to be restricted to the higher mountain slopes; *C. putoria*, Wied., which is widely distributed; *C. albiceps*, Wied.; and *Cordylobia roubaudi*, Villen. [**17** 239], which was observed in the deep burrows of ant-bears and wart-hogs during December–March.

EDWARDS (F. W.). **The Percy Sladen and Godman Trusts Expedition to the Islands in the Gulf of Guinea, October 1932–March 1933. —II. Diptera Nematocera.**—*Ann. Mag. nat. Hist.* (10) **14** no. 81 pp. 321–336, 2 figs. London, September 1934.

The only Anopheline recorded is *Anopheles gambiae*, Giles, from San Thomé. Amongst the species of *Culicoides* taken on the same island is *C. austeni*, C., I. & M., which is apparently the species previously recorded [*R.A.E.*, B **19** 194; **20** 40] as *C. hostilissimus*, Pittaluga. *Culex tamsi*, sp. n., is described from San Thomé.

Ambialet (R.). **Sur l'entraînement des larves de moustiques dans les cours d'eau.**—*Arch. Inst. Pasteur Algér.* **12** no. 2 pp. 205–208. Algiers, June 1934.

The author describes the following instances observed by him in Algeria of the carriage of mosquito larvae by running water. In a plant for the purification of water, larvae of *Culex* (almost all alive) were found in the cement aeration basins in water not more than $\frac{1}{5}$ inch deep that had fallen more than $4\frac{1}{2}$ feet into a cement channel, and adults were observed emerging. In a palm grove, adults of *Culex* emerged from holes in which the water dried up within 4–5 days between irrigations, having evidently entered in the larval stage from distant breeding-places. In channels designed to drain breeding-places, larvae have been known to travel more than 1,600 yards. In a water-hole in a garden that served as a breeding-place of Culicines only, numerous larvae of *Anopheles* were found after the first autumn rains, during which some flood-water had entered from a ravine in which Anophelines bred. The possibility of the dissemination of Anophelines by such means should not be overlooked in malaria control work.

Collignon (E.). **Observations sur la lutte antipaludique en 1933 dans le département d'Alger.**—*Arch. Inst. Pasteur Algér.* **12** no. 2 pp. 209–226, 7 pls. Algiers, June 1934.

Ambialet (R.). **Observations générales sur la campagne antipaludique de 1933 dans le département de Constantine.**—*T. c.* pp. 227–246, 2 graphs, 5 pls.

Gouget (R.). **La campagne antipaludique de 1933 dans le département d'Oran.**—*T. c.* pp. 248–254, 3 pls.

Accounts are given of work carried out in the control of malaria in Algeria in 1933, including measures against Anopheline larvae. On the basis of observations in the Department of Algiers, the characters distinguishing the breeding-places of the commoner species are summarised. *Anopheles maculipennis*, Mg., breeds chiefly in the plains, in water with an earthy bottom and containing *Potamogeton* and similar aquatic plants ; it is most numerous in spring and is frequently associated with *Culex hortensis*, Ficalbi. *A. hispaniola*, Theo., breeds chiefly in hilly country, in water with a pebbly bottom and containing green filamentous algae ; it is most numerous in summer, and is associated with *C. mimeticus*, Noé. *A. marteri*, Sen. & Prun., breeds in hillside ravines, in water with a rocky bottom and no vegetation ; it occurs only in spring and is often associated with smaller numbers of *A. claviger*, Mg. (*bifurcatus*, Mg. et auct.) [*cf. R.A.E.*, B **21** 83]. Breeding-places of *A. marteri* may harbour *A. hispaniola* later in the season, and when the latter occurs in still water, it is often associated with *A. maculipennis*. The seasonal sequence of Anopheline breeding-places received special attention in the Department of Constantine, where the earliest larvae were found in February and the latest at the beginning of December.

Mathis (M.). **Vaccination antiamarile du singe, à l'aide de virus vivant provenant du cobaye mort de la maladie expérimentale.**—*Bull. Soc. Path. exot.* **27** no. 6 pp. 505–510, 12 refs. Paris, 1934.

In experiments on the inoculation of monkeys (*Macacus rhesus*) with the " French strain " of yellow fever virus, which after 155 passages through mice and 10 through guineapigs, proved avirulent to the

monkeys but conferred immunity from infection with virulent strains [*cf. R.A.E.*, B **21** 135], 485 mosquitos [*Aëdes aegypti*, L.] were fed for several days on one of the inoculated monkeys. After an incubation period of 20 days, they were transferred to a healthy monkey, which they failed to infect. Nine days later, this monkey was exposed to the bites of mosquitos infected with the virulent Asibi strain; it succumbed to yellow fever in 6 days, whereas a normal monkey infected at the same time succumbed in 4 days. This delay of 2 days may have no significance, but the experiment showed clearly that the immunising strain had not recovered its virulence on passage through the invertebrate host [*cf.* **21** 141].

ROUBAUD (E.) & COLAS-BELCOUR (J.). **Observations sur la biologie de l'*Anopheles plumbeus*. III.—Le chevauchement des générations dans le cycle hibernal.**—*Bull. Soc. Path. exot.* **27** no. 6 pp. 546–551, 1 fig., 4 refs. Paris, 1934.

An account is given of further observations in France on the biology of *Anopheles plumbeus*, Steph. [*cf. R.A.E.*, B **21** 231]. Larvae that undergo a period of asthenobiosis were found to occur in every generation. Those from the first batches of eggs laid by females derived from the overwintering larvae were all active, taking between 19 and 50 days at outdoor temperatures to complete their development. Some of those from the second batches laid by the same females after a second blood meal showed asthenobiosis, emergences occurring at intervals ranging from 23 to 315 days after hatching. Two larvae in the fourth instar and one in the third survived for more than 315 days at laboratory temperatures. Thus the character of asthenobiosis may be found in the first generation and appears to be due to the age of the female at the time of oviposition [*cf.* **16** 183]. On the other hand, eggs laid by young females of the second generation gave rise to some larvae that developed rapidly and to others that took as long as 10 months at laboratory temperatures to reach the adult stage, the last pupa appearing after a larval period of 314 days. Seventeen larvae from a batch of eggs laid on 18th July 1933 that had been kept at laboratory temperatures and had not pupated by October were maintained from this time at outdoor temperatures. Pupation did not occur until the winter was over, the last pupa appearing after a larval period of 322 days. Most of the adults obtained from larvae with retarded development were females. Although a third generation was not obtained in this series of rearings, batches of eggs were laid by females captured in nature during August–September, which doubtless belonged to the second generation. These eggs gave rise to hibernating individuals only, the larval period lasting between 135 and 271 days. Thus hibernating larvae may belong to a mixture of three generations, although it seems probable that there are relatively few from the first two, particularly as periods of drought in the course of the summer doubtless bring about the destruction of large numbers of asthenic larvae by drying up the breeding-places.

ROUBAUD (E.) & TREILLARD (M.). **L'indice maxillaire chez *Pseudomyzomyia ludlowi* (var. *sundaica* et var. *litoralis*) en Indochine méridionale.**—*Bull. Soc. Path. exot.* **27** no. 6 pp. 552–554, 4 refs. Paris, 1934.

Examination of the maxillary indices of *Anopheles litoralis*, King [*cf. R.A.E.*, B **20** 92] and *A. sundaicus*, Rdnw., from Indo-China [*cf.*

21 140] revealed no important difference between the two species, although the former had a slightly higher index and showed a larger proportion of individuals with more than 11 teeth than the latter. In places such as the Cochin China delta, where malaria infection is slight, both species are rare, but *A. litoralis* is the more numerous, whereas in the malarious region of Réam (Cambodia) *A. sundaicus* is the more prevalent and has been found infected.

TREILLARD (M.). *Pseudomyzomyia ludlowi* **en Indochine méridionale: variétés, biologie et pouvoir pathogène.**—*Bull. Soc. Path. exot.* **27** no. 6 pp. 554–559, 2 figs., 7 refs. Paris, 1934.

Anopheles (*Pseudomyzomyia*) *ludlowi*, Theo., has not been found in Indo-China, but *A. sundaicus*, Rdnw. and *A. litoralis*, King, both originally described as varieties of this species, were taken along the coast, the proportion of the former to the latter decreasing from 93 : 7 at Réam in Cambodia to 60 : 40 in Cochin China and 0 : 100 in southern Annam. Of the larvae of the group that in Indo-China includes these two species as well as *A. subpictus*, Grassi, and *A. vagus*, Dön., only those of the last-named have been considered distinguishable. The author has, however, reared adults of *A. vagus* in proportions as high as 20 per cent. from larvae of the *subpictus* type and points out that workers in the Netherlands Indies have reared adults of *A. subpictus* from larvae of the *vagus* type [*R.A.E.*, B **13** 111]. Differences in the wing-markings of the five above-mentioned species and *A. parangensis*, Ludl., are illustrated; in addition to clearly identifiable individuals, the author found a certain number of examples showing intermediate characters. From its house-haunting habits, serological tests of its intestinal contents and its maxillary index [see preceding paper], *A. sundaicus* would appear to attack man more readily than *A. litoralis*. The former species may live as long as 70 days in the laboratory, or longer than such malaria vectors as *A. minimus*, Theo., *A. aconitus*, Dön., and *A. jeyporiensis*, James, and also than *A. vagus*, which rarely lives for 15 days; this appears to be due to its aggressiveness and the possibility of more frequent blood meals. Larvae of the *subpictus* type, giving rise to *A. sundaicus* and *A. litoralis*, were always found in Indo-China in more or less brackish water (the degree of salinity varying from 1½ to 26 per mille), in borrow pits and more or less well-defined lagoons in Cambodia, and in Cochin China and Annam in salt marshes. *A. sundaicus* and *A. litoralis* are particularly abundant during the dry season, whereas *A. vagus* breeds chiefly in the rainy season. The numbers of the larvae of the *subpictus* type vary everywhere in inverse relation to those of the *vagus* type. Breeding in this case is not related solely to the production of breeding-places by the rains, but largely to the humidity requirements of the adults. Control of *A. sundaicus* is facilitated by the house-haunting habits of the adults and the localisation of its breeding-places.

FARINAUD (M.). **Essai de prophylaxie rationelle du paludisme en milieu infantile à Tri-Cu (Tonkin).**—*Bull. Soc. Path. exot.* **27** no. 6 pp. 568–575, 1 ref. Paris, 1934.

An account is given of an epidemic of malaria in an agricultural colony for children at Tri-Cu that broke out at the beginning of 1930. In spite of the prophylactic administration of quinine instituted in April, the sickness rate remained high, and in June–August grave forms of the disease appeared and a mortality of 11 per cent. was recorded

for these 3 months. Reduction in hours of work, amelioration of general conditions of hygiene, strict medical supervision and regular dosing with quinine resulted in a better general state of health and a definite reduction in the sickness rate, but an investigation in February and November 1931 showed that the spleen and parasite rates were still high. Three Anopheline surveys carried out in the same year, in February, July and November, revealed the presence of 9 species, including *Anopheles minimus*, Theo., *A. jeyporiensis*, James, and *A. aconitus*, Dön., which are known or suspected vectors of malaria in Indo-China [*cf. R.A.E.*, B **21** 31, 123]. The percentage of the dangerous species reached 11 among the larvae and 21 among the adults. Weekly oiling of breeding-places within a radius of 880 yards was begun in February 1932 and supplemented in 1933 by more permanent measures such as straightening the bed of the stream in which *A. minimus* had been found, coverings its banks with a layer of clay and filling pools or converting them into terraced rice-fields. From April 1932, larvae of the dangerous species practically disappeared, even though flooding of the region interrupted oiling on 15th June. Moreover, from the beginning of the work, not a single example of the malaria-carrying species (principally *A. minimus* and *A. jeyporiensis*) was found in houses. In 1933 and in January 1934, these results were confirmed, and the increase in numbers of larvae that usually occurs at the end of the rainy season was not observed. The spleen index and parasite rates, respectively, fell from 42·6 and 38·8 per cent. in April 1932 to 5·3 and 3·3 per cent. in January 1934. The percentage of cases infected with *Plasmodium falciparum* decreased gradually from 100 in February 1931 to 16 in September 1933, and in January 1934 the only infections observed were due to *P. malariae*. This may be due to the action of the mosquito control in preventing re-infections, with the result that only the more resistant but at the same time less pathogenic forms of *Plasmodium* survive.

CHÉNEVEAU (R.). **Note sur les trous de crabes à Anécho (Togo).**—*Bull. Soc. Path. exot.* **27** no. 6 pp. 590–593. Paris, 1934.

Although no larvae of *Aëdes aegypti*, L. (*Stegomyia fasciata*, F.) were found elsewhere at Anécho (Togoland), they were found in oviposition traps almost every week. The inhabitants declared that mosquitos were absent, but the author was constantly attacked while walking on the beach about 100–550 yds. from houses, even though the wind was blowing from the ocean. This led to the discovery that breeding of mosquitos, particularly *A. aegypti*, was occurring in crab-holes [*cf. R.A.E.*, B **17** 142]. Encouraging results were obtained by blocking the holes, destroying the crabs, and clearing vegetation to enable poultry to devour the young ones. Adult mosquitos, which were only found in large holes (with a diameter of about 4 inches), were taken in 869 of the 7,534 holes treated. They were identified as *A. aegypti*, *A. irritans*, Theo., and *Anopheles gambiae*, Giles (*costalis*, Theo.). This discovery is of importance in a country where malaria is not uncommon and yellow fever has been recorded in previous years.

CURASSON (G.). **La " fièvre de la Vallée du Rift " existe-t-elle au Soudan français ?**—*Bull. Soc. Path. exot.* **27** no. 6 pp. 599–602, 2 refs. Paris, 1934.

The author considers that a disease of sheep observed at Macina and Bamako in the French Sudan and identified by him some years ago as

braxy is more probably Rift Valley fever [*cf. R.A.E.*, B **19** 207, etc.], since he had succeeded in transmitting it from sheep to sheep by the injection of blood, the latter disease being transmissible by this method whereas the former is not.

LEGENDRE (F.). **Expériences de projection de poudres larvicides par avions à Madagascar.**—*Bull. Soc. Path. exot.* **27** no. 6 pp. 603–608. Paris, 1934.

An account is given of the application of Paris green by aeroplane for the control of Anopheline larvae in the vicinity of the aviation camp at Ivato, which is practically surrounded by swamps and rice-fields. The results, as indicated by the numbers of larvae collected by dipping, were sufficiently encouraging to warrant the continued employment of this method.

RAYNAL (J.) & GASCHEN (H.). **Sur la présence de phlébotomes dans le nord de l'Indochine.**—*Bull. Soc. méd. chir. Indochine* **12** no. 5 pp. 531–532. Hanoi, May 1934.

RAYNAL (J.) & GASCHEN (H.). **Sur les phlébotomes d'Indochine. I. Présence de** *Phlebotomus barraudi* ♀ **au Tonkin.**—*Bull. Soc. Path. exot.* **27** no. 6 pp. 559–563, 3 figs., 3 refs. Paris, 1934. **II. Présence de** *Phlebotomus bailyi*, **var.** *campester* ♀ **au Tonkin.**—*T.c.* pp. 563–567, 3 figs., 2 refs. **III.** *Phlebotomus stantoni*, **Newstead 1914, au Tonkin. Sur la synonymie de** *Phlebotomus maynei* ♂, **Sinton 1930 et de** *Phlebotomus stantoni* ♂.—*T.c.* no. 7 pp. 670–679, 6 figs., 5 refs.

In the first paper, the authors record the capture, in May 1934 in an abandoned building in Tonkin, of 6 females of *Phlebotomus barraudi*, Sinton, 3 of *P. bailyi* var. *campester*, Sinton, and 1 of *P. stantoni*, Newst., and 1 male of *P. maynei*, Sinton. After briefly discussing the distribution of these species, they point out that this appears to be the first record of the genus in Indo-China.

In the following papers, detailed descriptions of these sand-flies are given. The male determined as *P. maynei* in the first paper is considered in the fourth to be the hitherto unknown male of *P. stantoni*, so that the former species, which was described from the male only [*R.A.E.*, B **18** 276], becomes a synonym of the latter [*cf.* **19** 234].

LEVER (R. J. A. W.). **Notes on Mosquitoes of the British Solomon Islands.**—*Brit. Solomon Is. agric. Gaz.* **2** no. 2 p. 16, 1 fig. Tulagi, April 1934.

Notes are given on a few of the more common of the 37 species of mosquitos known from the British Solomon Islands Protectorate, *viz.*, *Anopheles punctulatus*, Dön., and *Aëdes scutellaris*, Wlk. (*variegatus*, Dol.), which has two well-marked varieties, *tongae*, Edw., from Sikiana and the Santa Cruz Islands and *hebrideus*, Edw., from Rennell and Santa Cruz [*cf. R.A.E.*, B **21** 200], *A. funereus* var. *ornatus*, Theo., and *A. imprimens*, Wlk., which are annoying to man in the open, and *A. aegypti*, L. (*argenteus*, Poir.), the most abundant species in houses. Yellow fever is not known to occur on the Islands.

Milne (J. C.). **Observations on Malaria in Taiping.**—*Malayan med. J.* **9** no. 2 pp. 31–39, 3 graphs, 11 refs. Singapore, June 1934.

In the course of this paper, the author discusses the influence of climatic factors on malaria incidence in Taiping, using figures obtained over a period of six years (1928–33), and concludes that it is not correlated with rainfall, relative humidity or maximum shade temperature. The Anophelines found in Taiping are *Anopheles maculatus*, Theo., *A. karwari*, James, *A. hyrcanus*, Pall., *A. barbirostris*, Wulp, *A. kochi*, Dön., *A. vagus*, Dön., *A. philippinensis*, Ludl., and *A. subpictus*, Grassi (*rossi*, Giles).

Vickers (W. J.). **Some recent local Advances in the Economics of practical Malarial Control.**—*Malayan med. J.* **9** no. 2 pp. 40–43, 33 refs. Singapore, June 1934.

The author briefly reviews recent investigations that have been carried out in Malaya on measures for the control of malaria, particularly those directed against Anopheline larvae.

Strahan (J. H.) & Norris (V. H.). **Notes on the Incidence of the Filariasis in Province Wellesley North.**—*Malayan med. J.* **9** no. 2 pp. 44–47, 1 map. Singapore, June 1934.

A general survey of the villages in Province Wellesley North, which is bounded on the west by the sea, was undertaken towards the end of 1932 and showed that elephantiasis was fairly common in the north-west corner. In a survey to determine the incidence of filariasis, no cases with clinical symptoms were found except in a narrow strip of land along the northern half of the coast. This area chiefly consists of rice-fields intersected by sand-banks along which straggle the villages. The disease was prevalent in villages on the central sand-bank, but absent from those on the sea coast itself, and it is suggested that this may be due to sea breezes driving the mosquitos away. To test this theory, mosquitos were caught in two representative villages ; 11 examples of *Culex fatigans*, Wied., and 13 of *C. sitiens*, Wied., were taken in the village on the sand-bank and 2 and 6 respectively in that on the coast. Other species found in regular collections were *Anopheles vagus*, Dön., *A. barbirostris*, Wulp, and *A. hyrcanus*, Pall. Dissection of 65 mosquitos revealed no infections. All microfilariae identified from blood-films proved to be *Filaria* (*Microfilaria*) *malayi*.

Sweet (W. C.) & Rao (B. A.). **Notes on Malaria in Mysore State. Part V. The Control of Anopheline Breeding in Bangalore City and its Cost in Mysore State.**—*Rec. Malar. Surv. India* **4** no. 2 pp. 95–110, 5 graphs, 4 refs. Calcutta, June 1934.

The malaria situation in Bangalore City is discussed in detail. Observations in 1929 showed that transmission was due to *Anopheles culicifacies*, Giles, breeding in reservoirs and marshes, and to *A. stephensi*, List., breeding in wells. The former was successfully controlled by the application of a 1 per cent. mixture of Paris green [*cf. R.A.E.*, B **22** 69]. The wells were at first treated by stocking half of them with *Gambusia affinis* (introduced from Italy in 1928) and

applying Paris green to the remainder. Although the latter method was more efficient, the use of *Gambusia* produced satisfactory results, and as it is cheaper, it was later adopted throughout the city.

The cost of malaria control in Mysore State is discussed.

COVELL (G.) & BAILY (J. D.). **Malaria in Sind. Part IX. Malaria in Sukkur District. Part X. Malaria in Dadu District. Part XI. Malaria in Larkana District.**—*Rec. Malar. Surv. India* **4** no. 2 pp. 119–191, 12 refs. Calcutta, June 1934.

The following is largely taken from the authors' summaries: An account is given of malaria surveys carried out in various localities in the Sukkur, Dadu and Larkana Districts of Sind between 1927 and 1932. Dry crop cultivation is carried out over most of the first District and the amount of endemic malaria is generally low, except in tracts lying between the Indus and the flood restriction embankments, which are subject to annual inundations. The incidence of the disease is also higher in villages situated in areas where date palms are cultivated, the method of irrigating the young trees affording favourable breeding-places for *Anopheles culicifacies*, Giles, the principal vector. The main features of the epidemic of 1929 were similar to those recorded in Shikarpur and the neighbouring villages [*R.A.E.*, B **21** 82].

In the second District, the amount of malaria varies widely in different localities. The disease is hyperendemic in the rice tract and fairly prevalent in the dry crop area between the Western Nara Canal and the Indus, whereas in the villages at the foot of the Kirthur hills and on the margins of the Manchhar Lake the incidence is low. This District, which lies in Central Sind, is affected only to a moderate extent by regional epidemics centred in Upper and Lower Sind.

In the third District, the villages visited were almost all situated in the chief rice-growing area of Sind, where malaria is generally hyperendemic. Spleen rates were very high during the height of the regional epidemic of 1929, and were also extremely high in most villages in the autumn of 1932 after an unusually severe malaria season.

The effect of the Lloyd Barrage scheme in each of the Districts is discussed, and it is pointed out that a progressive rise in the subsoil water level, resulting eventually in water-logging, may be caused either by the effect of the new perennial irrigation on the drainage capacity of the soil or by seepage from the canals [*cf.* **19** 43]. Any serious rise in subsoil water level is likely to lead to an increase of malaria. Moreover, in certain localities, the beds of old canals are being used for new ones, and in places where loops of the old canals are cut off, forming a kind of backwater, it seems probable that the incidence of malaria will rise. It is also possible that the introduction of so much water on to the land both earlier and later than formerly may result in an increase in the length of the malaria transmission season by increasing the humidity of the atmosphere. The Barrage scheme came into operation in 1932, and observations made between June 1932 and June 1933 showed that a marked rise in the subsoil water level in large areas of the rice tract did occur. In the absence of any other cause, such as excessive rainfall or flooding, its seems probable that the high incidence of malaria in the Larkana District was actually due to the operation of the scheme.

Satyanarayana (K.). **A Mosquito-Flight Experiment.**—*Rec. Malar. Surv. India* **4** no. 2 pp. 193–195. Calcutta, June 1934.

To determine whether cases of malaria occurring on one side of the entrance channel to Vizagapatam harbour could be caused by mosquitos that had bred on the opposite side, about 400 Anophelines and Culicines were stained with methylene blue (1 : 10,000) and released on the southern side between 27th August and 28th October. Single stained examples of *Culex* sp., *Anopheles pallidus*, Theo., and *A. subpictus*, Grassi, were caught on the northern side on 3rd, 4th and 16th September respectively, at distances of 800–900 yds. from the point of release. It is therefore considered essential to apply oil or Paris green on the southern side, where there are potential breeding-places of *A. culicifacies*, Giles, *A. fluviatilis*, James, and *A. stephensi*, List.

Manson (D.). **Some Notes on the Identification of some Anopheline Larvae by Macroscopic Methods.**—*Rec. Malar. Surv. India* **4** no. 2 pp. 197–203. Calcutta, June 1934.

Notes are given on the external characters of the larvae of 18 of the commoner species of *Anopheles* found in Assam, by means of which they can be identified by the naked eye when placed alive in a flat, white porcelain dish, provided that they are full-grown and freshly caught. The principal points used in identification are shown in a table.

[Zasukhin (D. N.), Tiflov (V. E.) & Shul'tz (R. É.),] **Засухин (Д. Н.), Тифлов (В. Е.) и Шульц (Р. Э.). Endo- and Ectoparasites of *Arvicola amphibius* L., 1758. Communication II.** [*In Russian.*] —*Rev. Microbiol.* **13** no. 1 pp. 85–86, 15 refs. Saratov, 1934.

This second contribution [*cf. R.A.E.*, B **20** 250] to a projected study of the rodents connected with diseases of man and domestic animals in the Russian Union consists of a preliminary list of the parasites of *Arvicola amphibius*, a reservoir of tularaemia [**19** 85], hitherto recorded from the south-east of European Russia. The list includes 3 species of ticks, 9 of fleas and 1 of Anoplura, with indications of the frequency of their occurrence and references to the literature.

[Rukhadze (N. P.).] **Рухадзе (Н. П.). *Gambusia* in Abkhasia.** [*In Russian.*]—*Med. Parasit.* **3** no. 1 pp. 60–68, 7 refs. Moscow, 1934.

Since the introduction of *Gambusia* into Abkhasia (Transcaucasia) from Italy seven years ago [*R.A.E.*, B **19** 26], this fish has also been liberated in Russian Central Asia, North Caucasus and Odessa [**22** 20]. In Abkhasia, numerous breeding-ponds have been established, and nearly all reservoirs that are likely to harbour Anopheline larvae are now stocked with it. In the Sukhum district, *Gambusia* was very effective in 1932 in 78 per cent. of the total area of water infested, and in four years the amount of material used for oiling has been reduced by almost 50 per cent. *Gambusia* destroys the eggs and pupae, which are scarcely affected by oil or Paris green. The fish distribute themselves by entering streams, rivers and swamps after heavy rains. Some are carried by water during spring floods and remain in pools left after these recede, which are a prolific source of Anophelines. The efficiency

of *Gambusia* has also been demonstrated in ponds and lakes formed by mountain springs, but as the water in these is too cold for the fish to breed, they have to be artificially stocked. Artificial, temporary water reservoirs are stocked with *Gambusia* at the rate of 1 fish to 10 sq. ft. of the water surface if there is no vegetation, the number being increased in proportion to the density of the vegetation. Usually, most of the fish present in temporary accumulations of water die after these have dried up; in order to avoid the necessity of restocking, deep pits ("wells") should be dug at the bottom of such pools, ditches or ravines, as some of the water and a few fish will remain there till the next heavy rain or flood [*cf.* **20** 88]. The presence of iron oxide, or even traces of it, in the water is fatal to the fish [but *cf.* **20** 266]; in the laboratory, they died when kept in water supplied by recently installed iron pipes.

The chief enemies of *Gambusia* in Abkhasia are wild and domestic ducks, and snakes. In one locality, the fish were protected from snakes by spraying kerosene on the surface of the water, or strewing sulphur on the soil round the reservoirs. Administrative measures had to be taken against the population, who made wide use of *Gambusia* for feeding their ducks, geese and even pigs.

[Nabokov (V. A.).] **Набоков (В. А.). The Results of the Application of the Aviochemical Method in the Control of Malaria in 1933.** [*In Russian.*]—*Med. Parasit.* **3** no. 1 pp. 68–73, 1 diagr., 2 refs. Moscow, 1934.

The first part of this paper deals briefly with the defects in the organisation in the Russian Union of anti-malaria work by applying Anopheline larvicides from aeroplanes in 1931–33, and outlines a plan for a better organisation in 1934.

In the second part, a brief survey is given of further experiments in aeroplane dusting with the new copper arsenite preparation "Arsmal" [*R.A.E.*, B **22** 37] against Anopheline larvae in peat bogs near Moscow from June till the middle of September 1933, during which time 23 tons were released over an area of nearly 45,000 acres. Owing to the defective quality of the material received from the factory, which was badly packed and had a moisture content of 3·39–7·9 per cent. instead of the standard 1·2 per cent., a light dust-like cloud could not be produced, and the effective strip of dust was only 85 ft. wide in most cases instead of 230–260 ft. Nevertheless, in two of the treated localities, the malaria incidence decreased to 0·33 and 1·4 per cent., as compared with 1·75 and 10·8 per cent. respectively in 1932; in the third, the curve of malaria cases dropped sharply in July and August from the maximum reached in May.

[Okunevskiĭ (Ya. L.) & Khakhaeva (V. V.).] **Окуневский (Я. Л.) и Хахаева (В. В.). The Volatility and Rate of Evaporation of Insecticidal Fumigants. The Importance of Volatility and Evaporation.** [*In Russian.*]—*Med. Parasit.* **3** no. 1 pp. 82–91, 1 fig., 5 refs. Moscow, 1934. (With a Summary in French.)

This is a detailed account of the methods used in determining the volatility and rate of evaporation of a number of chemical substances with a view to estimating their suitability for use in fumigation against insects. The order of volatility of those tested was: benzine, carbon tetrachloride, methyl alcohol, xylol, turpentine, fusel oil (amyl alcohol), kerosene and isoamyl alcohol. The first two, which had also the

highest rate of evaporation, may be considered the most suitable for the quick formation of a lethal concentration at room temperature. Substances of the xylol group can only be used at a considerably raised temperature. Tests with laboratory animals, however, indicated that fumigants with the highest volatility are not necessarily the most toxic.

[Yatzenko (F. I.).] **Яценко (Ф. И.). The Application of Chloropicrin in the Control of the Larvae of Malaria Mosquitos.** [*In Russian.*]—*Med. Parasit.* **3** no. 1 pp. 91–93, 1 ref. Moscow, 1934.

On the basis of successful experiments in the Ukraine, recommendations are given for the application of chloropicrin against Anopheline larvae [*cf. R.A.E.*, B **21** 257]. For use as a fumigant, 1 gal. chloropicrin (for treating about 12 acres of water surface) is poured into a receptacle with a tightly fitting lid containing 10 lb. dry sifted road dust and 2 gals kerosene. The mixture is allowed to stand for at least 4–6 hours before being mixed on the ground with dry coarse road dust until a uniform friable mass is obtained, which is then immediately applied to the water by means of any type of hand duster. The pupae and the first-instar larvae begin to die within 30 minutes, and in 24 hours from the beginning of the fumigation all stages of all mosquitos (including Culicines) present are killed, as are also water beetles, dragonflies, molluscs and frogs. Fish are not affected, provided that the water is more than 6 ins. deep. As chloropicrin in a concentration irritating to the eyes lingers for about 2 hours, men and cattle should be prevented for this time from approaching the treated area within a radius of about 3–5 times the width of the fumigated water reservoir. This method is superior to dusting with Paris green, because all stages of the mosquitos are killed.

For use as a stomach poison, 100 parts (by weight) of well ground dry flour (of which about 1 lb. should be used per acre of water surface) are mixed in a receptacle provided with a tightly fitting lid with 100 parts of well sifted road dust, 10–15 parts of chloropicrin and an equal quantity of kerosene to moisten the mixture. In 24 hours, when the chloropicrin has been sufficiently absorbed by the particles of flour, the receptacle is taken to the reservoir and mixed with unsifted dry road dust (1 : 4 for application with dusting apparatus, or 1 : 20 for broadcasting by hand). Chloropicrin at this strength does not destroy Anopheline eggs or pupae, but all the larvae are killed within 10–12 hours by ingesting the mixture.

[Kucher (S. S.).] **Кучер (С. С.). Anthracene—a new Material for combating the Larvae of Malaria Mosquitos.** [*In Russian.*]—*Med. Parasit.* **3** no. 2 pp. 141–148, 9 refs. Moscow, 1934.

In view of the high cost of Paris green in Russia, attempts were made to find a cheaper substitute for use against larvae and pupae of *Anopheles maculipennis*, Mg. Of the various waste and by-products of chemical works tested in the laboratory, anthracene oil proved to be the most effective, giving a 100 per cent. mortality of the larvae and pupae, but its high cost makes its use prohibitive. The most suitable was a little-used product of the coke-benzene industry, of which large quantities are available at a low price. This is a powder containing 12–15 per cent. of pure anthracene; it has a specific gravity of 1·2,

melts and sublimates at 216°C. and boils at 360°C., and is insoluble in water but dissolves to a small extent in alcohol, better in ether and benzene and completely in glacial acetic acid. Road dust proved to be a better carrier for it than sawdust, as it prevented the formation of lumps. In the laboratory, a 5 per cent. concentration killed 98 per cent. of the larvae, and a 10 per cent. one 92 per cent. Owing to the uneven mixing of the materials in practice, however, the latter strength is recommended. In aquariums in which the water had a temperature of 24°C. [75·2°F.] and a 7·4 pH content, the powder (at the 10 per cent. concentration) was applied at the rate of about 1 oz. to 30 sq. ft. of the water surface ; within 5 hours of dusting, all the larvae and 20 per cent. of the pupae of *A. maculipennis* and 80 per cent. of the *Culex* larvae were killed. First-instar Anopheline larvae died in one hour. In a number of field experiments, a 10 per cent. concentration applied with a hand duster gave almost 100 per cent. mortality of Anopheline and Culicine larvae. It is essential that a thin film of dust be formed on the water surface. Special tests indicated that exposure to sunlight or wind does not affect the larvicidal properties of the powder. Its effect on fish and aquatic vegetation has not yet been studied.

The use as a larvicide of contaminated waste water of the tar-distilling, ammonia and benzene departments of chemical works cannot be recommended, as its chemical composition is not constant.

[Pod'yapol'skaya (V. P.) & Gnedina (M. P.).] **Подъяпольская (В. П.) и Гнедина (М. П.). On the Rôle of Flies in the Epidemiology of Helminthic Infections.** [*In Russian.*]—*Med. Parasit.* **3** no. 2 pp. 179–185, 1 fig., 7 refs. Moscow, 1934. (With a Summary in French.)

The literature on the dissemination of helminthic infestation of man by flies is briefly reviewed. In the laboratory, adults of *Musca domestica*, L., and *Calliphora erythrocephala*, Mg., were fed on human excreta or horse dung artificially infested with the eggs of *Ascaris lumbricoides*, *Enterobius vermicularis*, *Diphyllobothrium latum*, or *Trichuris* (*Trichocephalus*) *trichiura*. Microscopic examination of the flies generally revealed the presence of eggs of the helminths (except *Trichuris*, of which only a small number were used). Most of the eggs occurred on the wings, a few on the legs and none on the proboscis. No helminth eggs occurred in matter regurgitated or faeces deposited by *M. domestica* on glass slides ; this may be explained by the size of the eggs, which are too large for the flies to swallow, except that those of *E. vermicularis* or *T. trichiura* might occasionally pass through the proboscis lengthwise. The specks deposited by *C. erythrocephala*, on the other hand, usually contained a large number of eggs (the maximum being 53) of all species (again excluding *Trichuris*). In dried up matter the eggs were often shrivelled, but in a drop of water they regained their normal aspect.

In observations under natural conditions in Daghestan, helminth eggs occurred in the specks deposited by the flies on a number of glass slides placed in the hall and dining room of a slaughter-house and in the kitchen and dining room of a railway restaurant, where flies swarmed in enormous numbers. Two eggs of *Dicrocoelium lanceolatum* (which heavily infested the livers of the slaughtered cattle and sheep) were found in specks deposited on glass slides in the laboratory by flies that were captured in the slaughter-house at least an hour before. It is calculated that on an average 3 helminth eggs were found in the specks

deposited by only 34 flies in 12 hours, which indicates the important rôle played by flies in the distribution of helminth infestation in places where human faeces are accessible to them.

Nijkamp (J. A.) & Swellengrebel (N. H.). **Proeven over anophelesvernietiging met pyrethrumpraeparaten.** [Experiments on the Destruction of *Anopheles* with Preparations of Pyrethrum.]—*Ned. Tijdschr. Geneesk.* **78** no. 21 pp. 2327–2338, 2 pls. Amsterdam, 26th May 1934. (With Summaries in English and German.)

In Holland, more importance has been attached of recent years to the destruction of hibernating adults of *Anopheles* [*maculipennis*, Mg.] in dwellings than in stables, because of the relatively high malaria infection rate in the former. Proprietary fly-sprays have proved suitable, but their cost is a bar to general use. As a result of experiments here described in detail, a formula already noticed [*R.A.E.*, A **22** 116] was developed. This spray involves no danger of fire.

In tests to ascertain the effect of various concentrations of pyrethrum in kerosene, batches of 100 laboratory-bred house-flies (*Musca domestica*, L.) of uniform age were released in a box of 1 cu. m. capacity immediately after 2 cc. of the solution had been sprayed as a mist. After 10 minutes, mortalities of 15, 21 and 54 per cent. were obtained with concentrations of 1, 5 and 10 per mille respectively. Kerosene alone killed 6 per cent. or less, 8 per cent. being, however, attained with a kerosene rich in naphthenes and with a high boiling point (200–250°C.). Of proprietary fly-sprays tested, the most toxic were Shelltox (giving a mortality of 53 per cent.) and Flit (42–47 per cent.). Equally good percentages were, however, obtained with 1 per cent. solutions of commercial pyrethrum extracts in kerosene prepared in the laboratory. There was no significant difference between a solution in ordinary kerosene and in one rich in naphthenes.

In consequence of these tests, the authors used at Medemblik a spray containing 10 gm. pyrethrum extract per litre kerosene with the addition of oil of sassafras, which causes the mosquitos to fly up. Methyl salicylate was added simply as a perfume. For work in stables, it was found an advantage to replace part of the kerosene by vaseline oil, as the animals coughed less. The formula given is kerosene 550 cc., vaseline oil 450 cc., methyl salicylate 20 cc., oil of sassafras 10 cc., and pyrethrum extract 10 gm. An examination of the various extractants of pyrethrum showed petroleum ether to be the best [**22** 116]. Ethyl ether and ethylene trichloride came next, and carbon tetrachloride last.

Tests of the toxicity to *M. domestica* of various commercial pyrethrum dusts showed differences which are tabulated. In tests in which they gave mortalities of 40–60 per cent., a coarse powder of the whole plant of *Artemisia maritima* grown in Holland killed 33 per cent.

Against bed-bugs [*Cimex lectularius*, L.], it was necessary to increase the pyrethrum to 25 gm. per litre kerosene and to spray at least 15 cc. per cu. metre space. This resulted in a lasting disinfestation of a house. It was less successful against fleas.

Verslag over de jaren 1932 en 1933 van de Malaria-Commissie uit den Gezondheidsraad. [Report for 1932 and 1933 of the Malaria Commission of the Health Council of Holland.]—*Versl. Meded. Volksgezondh.*, June 1934, reprint 36 pp. [Amsterdam, 1934.]

No regular oiling or destruction of adults [of *Anopheles maculipennis*, Mg.] was done at Alkmaar and Amsterdam in 1932–33. At Medemblik,

anti-larval measures [*cf. R.A.E.*, B **20** 229] were dropped and the mosquitos became more abundant in consequence. As, however, malaria cases decreased both at Medemblik and in the environs where anti-larval measures had not been practised even in the preceding years, it is again concluded that in Holland such measures, the cost of which is high, are justified only in special circumstances [*loc. cit.*]. Various sprays were tested against the adults [see preceding abstract].

In the area newly reclaimed from the Zuyder Zee, the high salinity of water in dikes exercised natural control on a large scale. Nevertheless, in 1932 the abundance of adults (as shown by catches in experimental pig-sties) was about the same as it had been at Medemblik during the campaign there, *i.e.*, one quarter that in the surrounding country. In 1933, they were as abundant in dwellings in the new area as at Medemblik, but in the animal quarters, which usually contained only rabbits and fowls, they were far less numerous. The newly settled inhabitants, despite the smaller number of mosquitos, were therefore exposed to greater danger than those of old districts, where there was considerable likelihood that infected individuals would be attracted to pig-sties rather than attack man a second time.

The considerable flight-range of *A. maculipennis* [*cf.* **18** 23] was the chief reason why Medemblik, which had been artificially protected, and the newly reclaimed area, which was naturally protected by salinity, could not be kept free from malaria. Stained females liberated in the newly reclaimed area were recaptured at previously unattained distances of about $5\frac{1}{2}$ and $8\frac{1}{2}$ miles. In spite of this, anti-larval measures on a small scale may be sometimes advisable, because experience has shown that, of two localities fairly close to one another, one may be malarious and the other not. In fact, the females that transmit malaria from man to man (which are chiefly those that settle in houses in autumn and do not lay eggs) [*cf.* **18** 53] fly little, at most visiting nearby dwellings. The possibility of a house becoming a centre of malaria depends on three factors. The first is the proximity of breeding-places, all houses within the flight range being liable to be visited by *A. maculipennis* during its period of sexual activity. The second is the attractiveness of the house to female mosquitos in which sexual activity has ceased. The third is the source of infection ; certain houses become new foci of malaria because mosquitos that have acquired infection at a distance settle in them, whereas in others non-infected mosquitos that have settled find infected persons and acquire malaria which (especially if abundant) they spread to other inmates and to neighbours. Instances of the latter clearly show the need for thorough measures against the adults in dwellings.

In view of the international conference on malaria in Rome in 1934, the various stages in the progressive recognition of distinct races of *A. maculipennis* are surveyed. In Holland, malaria foci are confined to brackish water areas where the small race [*atroparvus*, van Thiel] predominates [*cf.* **22** 36 ; etc.].

DE BUCK (A.), SCHOUTE (E.) & SWELLENGREBEL (N. H.). **Cross-breeding Experiments with Dutch and foreign Races of** *Anopheles maculipennis*.—*Riv. Malariol.* **13** no. 3 pp. 237–263, 1 pl. Rome, 1934. (With a Summary in Italian.)

The authors state that the names used by them, in describing these experiments, to distinguish various races of *Anopheles maculipennis*, Mg., among which they include *A. sacharovi*, Favr (*elutus*, Edw.), are

to be understood as convenient popular designations, not as names subject to the rules of international nomenclature. In all the crosses, the parents were reared from selected ova, and the exochorion of the hybrid egg was of the same type as that of the egg from which the female parent had hatched.

Eggs resulting from reciprocal crosses of *messeae*, Flni., and *atroparvus*, van Thiel, both from Holland either did not hatch or produced larvae that were not viable. Crosses between males of *atroparvus* from Holland and females of *messeae*, *labranchiae*, Flni., or *A. sacharovi* from Italy, or typical *maculipennis* from Holland or Italy, were fertile, but the females of *atroparvus* were not fertilised by males of any of the other races except *labranchiae*. The males of the first hybrid generation, however, were sterile, except possibly a few of those resulting from the crossing of *atroparvus* and *labranchiae*. Even these last failed to breed, possibly owing to the dominance of the character of eurygamy in *labranchiae* [*cf. R.A.E.*, B **22** 137]. Females of the first hybrid generation, on the other hand, were generally fertile on crossing with the male parent (*atroparvus*). When the female parent was typical *maculipennis*, however, the hybrid females were sterile, and when it was *A. sacharovi*, the vitality of the first hybrid generation was very limited.

The evidence afforded by these experiments of the distinctness of the different races shows that anti-malaria measures in Holland could be safely concentrated on the one (*atroparvus*) known to act as a vector.

COMPAGNINI (G.). **Cambiamento dei caratteri somatici della fauna anofelica nella bonifica di S. Eufemia.** [The change in the Somatic Characters of the Anopheline Fauna in the Improved Area of S. Eufemia.]—*Riv. Malariol.* **13** no. 3 pp. 264–271, 1 map. Rome, 1934. (With a Summary in English.)

The author has investigated the Anopheline fauna of a district in Calabria where drainage and other improvements have been carried out to reclaim this highly malarious area. Among eggs deposited by mosquitos captured in May and June 1933, the typical *Anopheles maculipennis*, Mg., predominated absolutely, very few eggs of var. *labranchiae*, Flni., being present. In October, *labranchiae* predominated, the typical *maculipennis*, var. *messeae*, Flni., var. *atroparvus*, van Thiel, and *A. sacharovi*, Favr (*elutus*, Edw.) being also present. An investigation of the maxillary index showed that the zoophilous mosquitos with an average of more than 14 teeth were relatively more abundant in the localities where the agricultural transformation of the ground and the presence of stabled animals had long preceded drainage work. Where drainage had been continuously developed but no agricultural changes had taken place, there was an absolute predominance of anthropophilous mosquitos with an average of less than 14 teeth.

GIOVANNOLA (A.). **La colorazione vitale degli sporozoiti ed il suo impiego nella diagnosi dell'infettività degli anofeli.** [The Staining of living Sporozoites and its Use in diagnosing Infection in Anopheline Mosquitos.]—*Riv. Malariol.* **13** no. 3 pp. 327–331, 1 fig. Rome, 1934. (With a Summary in English.)

In the dissection of Anophelines to ascertain whether they are infected with malaria, a solution of 0·5 per cent. Brilliant Cresyl Blue in physiological salt solution may be used. The salivary glands on

extraction assume a blue tint that renders them immediately recognisable, and the sporozoites, which appear mobile and coloured, are easily seen. This technique was used by the author to detect experimental infections of *Plasmodium vivax* in *Anopheles maculipennis*, Mg., and of *P. praecox* in *Culex pipiens*, L.

DE BENEDETTI (A.). **Considerazioni tecnico-pratiche sui metodi di lotta contro le larve anofeline.** [Technical and practical Considerations on Methods of combating Anopheline Larvae.]—*Riv. Malariol.* **13** no. 3 pp. 365–371, 10 refs. Rome, 1934. (With a Summary in English.)

The author discusses various methods of dusting with Paris green against Anopheline larvae and concludes that the most effective and economical is the use of garden mould as a diluent after it has been rendered unsinkable by his special process [*R.A.E.*, B **21** 180; **22** 138].

[DRYENSKI (K.).] **Дрѣнски (К.). The Antimalarial Experimental Station at Petrich 1928–1933.** [*In Bulgarian.*]—*Mitt. bulg. ent. Ges.* **8** pp. 85–96, 2 maps, 3 graphs. Sofia, 1934. (With a Summary in English.)

In 1928, when the anti-malaria station at Petrich was established, the spleen and parasite indices in this region of south-western Bulgaria were 58·5–100 and 53–77 per cent. respectively, being almost the highest for Europe. This was due to economic and climatic conditions, as well as to the abundance of suitable breeding-places for Anophelines, chiefly *Anopheles maculipennis*, Mg., and *A. superpictus*, Grassi. Quinine has been administered since 1929 in a few villages only. Since 1930, an area of over 4,000 acres has been drained and about 33 miles of canals dug, and the larvae have been very effectively controlled by dusting with Paris green. Adult Anophelines at first continued to be present in dangerous numbers owing to migration from the untreated districts, as was proved by staining some of them. However, by gradually increasing the dusted area, the number has now been greatly reduced.

As a result of the campaign, the mean spleen and parasite indices fell to 20 and 2 per cent. respectively in 1933, the reclaimed land is being successfully cultivated and the health of the population is very satisfactory.

HACKETT (L. W.). **The present Status of our Knowledge of the Subspecies of** *Anopheles maculipennis*.—*Trans. R. Soc. trop. Med. Hyg.* **28** no. 2 pp. 109–140, 4 pls., 35 refs. London, 4th August 1934.

After discussing other characters that have been suggested as a means of distinguishing the different varieties or races of *Anopheles maculipennis*, Mg., the author concludes that at present the design on the dorsal surface of the egg, together with other details of its structure, is the most satisfactory one [*cf. R.A.E.*, B **21** 177]. He describes and illustrates the egg types of *A. maculipennis maculipennis* (*typicus*), with vars. *atroparvus*, van Thiel, *labranchiae*, Flni., *messeae*, Flni., and *melanoon*, n., as well as *A. sacharovi*, Favr (*elutus*, Edw.), which he provisionally treats as one of the varieties. The name *melanoon* is

proposed for the variety laying black or nearly black eggs that have previously been included with the banded egg of var. *messeae* [*cf.* *R.A.E.*, B **21** 136, 212]. Such eggs have recently been found almost unmixed in various parts of Italy and Spain, especially near rice-fields and fresh-water marshes. The breeding and overwintering habits and sexual behaviour of the varieties are reviewed, together with their capacity for transmitting malaria.

The following is substantially the author's summary : Each of the six varieties, as identified by the eggs, is to be found in a number of different areas that are widely separated geographically. Within its own climatic range, the presence of a given subspecies is determined by the orohydrographical conditions of the area, or more particularly the character of the surface water that the insect requires for oviposition. No observations as yet suggest that an environment or micro-environment suited to the adult of either sex can determine the presence or prevalence of any subspecies. It has not been shown that individuals laying the same kind of egg vary significantly in physiology or behaviour even if they come from different regions. Our surveys of new zones proceed, therefore, on the assumption that the egg type will serve to identify the subspecies, which is broadly homogeneous throughout its range, in spite of adaptations to local conditions. Such modifications are apt to be quantitative (as in duration of sexual repose in winter, or range of micro-climatic tolerance) rather than qualitative and genotypic.

The biological differences between subspecies are such as apparently to preclude hybridisation in nature, and while cross-mating has occurred in the laboratory, successive hybrid generations have never been obtained [*cf.* **22** 199]. The subspecies differ also in the frequency and regularity with which they bite man under the present conditions of rural life, and since this determines the amount of malaria transmission, some races are more consistent vectors than others. Thus, typical *maculipennis* and *melanoon* have little contact with man, whereas *labranchiae* and *A. sacharovi* are continually penetrating into houses in relatively large numbers wherever they occur ; *messeae* and *atroparvus* are easily diverted by domestic animals, but overflow into human habitations in search of food under various circumstances, among which are a disproportionate density of Anophelines, a scarcity of animals, or the stimulus of certain physical conditions, such as temperature, humidity, etc. Under identical conditions, the various subspecies behave quite differently, being drawn by diverse instincts into different environments and to different hosts. This in general explains their separate rôles in the spread of malaria, but whether a given subspecies becomes a vector or not in a given locality depends also on a complex of local conditions, which may in one place lead it into continual contact with man, or in another restrict it to animals to such a degree as to render malaria transmission highly improbable. The range of adaptation of *labranchiae* and *A. sacharovi*, however, is so wide that there is no region in which either is known to be effectively diverted from man by domestic animals.

In the course of the discussion that followed, the question of the taxonomic status of these varieties was raised, and the author's use of the term " subspecies " was criticised. It was also suggested that it might be desirable to have a name other than var. *maculipennis* or *typicus*, as it was not known from which variety the original type was described. The need for further laboratory work was stressed. In his

reply, the author stated that he thought it might be as well to accept the name *basilei*, which Falleroni had recently suggested for *typicus* [*cf.* **21** 136].

MARTINI (E.). **Ueber den Salzgehalt der Gewässer und die Malarialage.** [On the Salinity of Collections of Water and the Malaria Situation.] —*Ent. Beih. Berl.* **1** pp. 28–44, 3 figs., 2 refs. Berlin, 7th August 1934.

An account is given of the gradual recognition of differences in relation to malaria transmission among species of *Anopheles* and races of *A. maculipennis*, Mg. In Germany and Holland, malaria is found only where *A. maculipennis* var. *atroparvus*, van Thiel, is present. This race, which breeds in brackish water, is found along the coasts of various European countries and inland where salt occurs. The major part of the paper records conditions in the Danube delta as observed by the author. In Rumania, malaria is severe in the valley of the Pruth and in the lower valley of the Danube, but in the delta the index is very low [*R.A.E.*, B **21** 125]. In Danube villages outside the delta, where about 60 per cent. of the children showed symptoms of the disease, *A. maculipennis* was represented exclusively by var. *messeae*, Flni. It is therefore no longer possible to state that *messeae* can never maintain endemic malaria, though its capacity has not by any means been proved equal to that of *atroparvus*. In both the lightly and heavily infected Danube regions of Rumania, it was practically the only race present. In the delta, the inhabitants are well-fed [*loc. cit.*] and take precautions to avoid being bitten. The reed beds are fresh-water swamps, where *atroparvus* does not occur. They form ideal breeding-places for *Mansonia richiardii*, Ficalbi, of which enormous swarms are present. The other common mosquitos are *A. hyrcanus*, Pallas, a species that seems unimportant as regards malaria, and *A. maculipennis* var. *messeae*, usually found only in animal quarters and houses. The houses are kept as free as possible from these mosquitos, especially *M. richiardii*, and sleeping in the open is avoided. Moreover, cattle are abundant, whereas other parts of Rumania are predominantly agricultural. It is suggested that the outbreak of malaria after the Great War was due to the removal of cattle that occurred then.

In a coastal district near Constanza that was highly malarious and was thought to be a centre of *atroparvus*, mosquitos found breeding in brackish lakes included *A. sacharovi*, Favr (*elutus*, Edw.), a species not previously recorded from Rumania. This was investigated by G. Zotta, who found severe malaria long the coast southwards to Burgas (Bulgaria), where *A. sacharovi* displaced *atroparvus* entirely. *A. sacharovi* tolerates higher salinities even than *atroparvus* [*cf.* **16** 178; **22** 137].

It is suggested that forms of Anophelines occurring in southern countries, where stagnant water often loses its freshness during summer, become more resistant to salinity and are therefore able to penetrate northwards in regions of brackish water. As they require higher temperatures than the native northern forms, they overwinter in warmer situations and remain there longer in spring, so that *Plasmodium* is better able to develop in them. This would justify the old view that brackish water and malaria are connected, and suggests that, in regions where *A. maculipennis* transmits malaria, abundant fresh water with a good outflow should be supplied until all standing water and the soil

are cleared of salt. This seems to have occurred near Ferrara [*cf.* **15** 182]. In the Netherlands Indies newly established rice-fields do not become free from the dangerous brackish-water mosquito, *A. sundaicus*, Rdnw. (*ludlowi*, auct.) until after some years.

WILHELMI (J.). **Ueber Stand und Gestaltung der hygienischen Entomologie.** [On the Status and Organisation of Hygienic Entomology.] —*Ent. Beih. Berl.* **1** pp. 48–53. Berlin, 7th August 1934.

Hygienic entomology is defined as the branch of medical entomology that deals with the control of insects injurious to health. Its problems, including those connected with their biology (in its practical aspects), the testing of insecticides and the professional training and organisation of workers, are discussed with special reference to Germany.

WEYER (F.). **Ueber die Technik der Bestimmung des von Stechmücken gesogenen Blutes nach der Praecipitinmethode.** [On the Technique of Identification by the Precipitin Test of the Blood sucked by Mosquitos.]—*Ent. Beih. Berl.* **1** pp. 76–83, 11 refs. Berlin, 7th August 1934.

The technique of the precipitin test for determining the origin of blood found in mosquito guts is described. In the author's experiments in Germany [*R.A.E.*, B **22** 94], no difference in host preference was observed between *Anopheles maculipennis* var. *atroparvus*, van Thiel, and var. *messeae*, Flni. Owing to external conditions, both races feed primarily on cattle, but both sometimes enter dwelling rooms and attack man. Individuals containing human blood occurred among examples of var. *atroparvus* found in animal quarters in East Friesland, but in view of the much larger number that had fed on animals, it is impossible to regard this race as one that shows a marked preference for man. In the Danube delta in Rumania, over 60 per cent. of engorged females of var. *messeae* collected in dwellings contained human blood.

BARANOV (N.). **Golubačka mušica u godini 1934.** [*Simulium reptans columbaczense* in the Year 1934.] [*In Serbian.*]—*Vet. Arhiv* **4** pts. 8–9 reprint 48 pp., 1 pl., 5 figs., 2 maps, 30 refs. Zagreb, 1934. (With a Summary in Russian.)

A serious outbreak of *Simulium reptans columbaczense*, Schönb., occurred in April and May 1934 in 5 districts in north-eastern Jugoslavia, the numbers of animals killed by it being estimated as 6,643 sheep and goats, 2,874 cattle, 1,142 pigs, 572 buffaloes, 144 horses and 22 donkeys. A key is given to the females of this and allied species of *Simulium* occurring in Jugoslavia and adjoining countries, its systematic position is discussed [*cf. R.A.E.*, B **15** 78], and both sexes are described. The focus of infestation is believed to be somewhere near the Iron Gate on the Danube, whence it may spread east and south into Jugoslavia, owing to wind and the active migration of the flies from overcrowded areas in search of food. An outbreak may be expected following a low water level in the Danube in spring with a subsequent gradual fall, and dry and warm weather in late April and May (the time of adult emergence). Heavy rains and strong changeable winds cause a high rate of mortality among the adults.

During the day, the flies keep in sheltered places in the grass and bushes near forests and on the banks of rivers and brooks if there are any trees. Early in the evening or morning, the females disperse in various directions and readily attack animals. During an outbreak, however, the flies are active and feed throughout the day; some of the females lose their usual strong positive phototropism and enter houses and animal quarters and also attack man and animals after dark. In the evening, the flies rise high into the air, producing an incessant buzzing. They congregate round the animals gradually, and eventually settle on them so close together as to form a crust. Only hairless parts of the body are attacked. Definite preference is shown for cattle that are not kept clean, but the popular belief that black cattle are more subject to attack could not be verified.

An adequate supply of water and atmospheric humidity is essential for the life of the adults. When kept without food in wide test tubes protected from the direct rays of the sun, they lived for 10–12 days at 100 per cent. relative humidity but died in 12 hours in dry air.

The confusion of this Simuliid with the Chironomid, *Cardiocladius leoni*, Goetgh., swarms of which appear above the water several times during the spring, has led to erroneous beliefs concerning it.

The adults are preyed upon by those of the Anthomyiid, *Chirosia crassiseta*, Stein, and by the nymphs of an aquatic bug of the genus *Velia*, which seize them at the moment when they descend close to the surface of the water while swarming. Many of the flies were destroyed by being caught on the leaves and stems of *Parietaria officinalis* during the short period when these are viscous. No other species of insect was found sticking on the plant.

Special attention was devoted to tests of measures that would protect animals from attack. Of 20 preparations, 5 proved effective, 3 of these being proprietary. The others were an ointment made of 3 parts rectified kerosene to 10 parts yellow vaseline, and a solution of 1 part naphthalene in 10 parts liquid paraffin, both being lightly rubbed in by hand. The ointment should be applied at the rate of about 1 oz. per horse or cow in the morning, as its repellent action lasts the whole day. The solution is less effective and should therefore be applied 2–3 times a day at the rate of $1\frac{3}{4}$ oz. a time. For sheep, only one-third or one-half of these doses should be used.

ARIZUMI (S.). **On the potential Transmission of *Bacillus leprae* by certain Insects.** [*In Japanese.*]—*J. med. Ass. Formosa* **33** no. 349 pp. 634–661. Taihoku, Formosa, April 1934. (With a Summary in English, pp. 54–55.)

Observations at a leprosy sanatorium near Taihoku suggested that the insects most likely to spread the infection are the adults of *Musca domestica*, L. [*cf. R.A.E.*, B **22** 19] and *Lucilia caesar*, L., the cockroaches, *Periplaneta americana*, L., and *P. australasiae*, F., being next in importance, while mosquitos and the larvae of the flies are probably negligible. Leprosy bacilli were found in the guts of 195 out of 689 flies caught in wards where serious cases were treated, and in 177 out of 723 taken in wards for slight cases. Similar bacilli were also found in a much lower percentage of the flies taken in the administration building and in a dwelling house 220 yards away from the wards. On an average, 40·8 per cent. of the flies taken in the wards for slight cases, and a lower percentage in the dwelling house, had the bacilli on the body surface.

In flies fed on an emulsion of leprous nodules, the bacilli in the gut proved to be most numerous within 24 hours after feeding; after 72 hours, they had almost disappeared. It is concluded that they do not multiply in the flies, but are not affected by the bactericidal action of their secretions. On flies contaminated externally with an emulsion of leprous nodules, the bacilli propagated in a comparatively short time, but in 24–48 hours they were considerably reduced in number.

Of 307 larvae of the flies taken from stools of serious cases, 17·5 per cent. harboured an acid-fast bacillus; this could not be identified as *Bacillus leprae*, but it was not found in maggots from stools in the dwelling house. No bacilli were found in 300 pupae that had been fed on them in the larval stage, since the larvae expel micro-organisms in the intestinal canal in a short time, especially just before pupation.

Only 2 of 203 mosquitos taken after sucking blood from patients in an advanced stage of the disease were positive, and 195 mosquitos with no indication of a recent blood-meal were all negative. An acid-fast bacillus resembling *B. leprae* was found in the gut of 26·8 per cent. of 67 cockroaches caught in the wards for serious cases, and 12·3 per cent. of 105 in the wards for slight cases. Cockroaches fed on the emulsion of leprous nodules sometimes excreted the bacilli in their faeces within 8 hours, though they usually did so after 20–44. After 94 hours, excretion of bacilli ceased. The bacilli were not affected by passing through the alimentary canal of the cockroaches.

FERRIS (G. F.). **Contributions towards a Monograph of the Sucking Lice. Part V.**—*Stanford Univ. Publ. biol. Sci.* **2** no. 5 pp. 273–413, 79 figs. Stanford Univ., Calif., 1932. Price $2·00.

Some time has elapsed since the publication of the preceding part of this series [*R.A.E.*, B **11** 215], and in the interim additional information has been obtained on some of the genera already dealt with, or treatment by other authors has necessitated their further consideration. This additional information is given in the present paper, in which a number of small genera and the larger genus *Linognathus* are also considered.

COOGLE (C. P.). **Electrocution a new Aid in the Preparation of Mosquito Mounts.**—*Publ. Hlth Rep.* **49** no. 28 pp. 824–826, 2 figs. Washington, D.C., 13th July 1934.

The technique described was evolved to prevent the wings of mosquitos from closing during the process of mounting. Just before the insect revives from anaesthetisation with ether, a fine wire is thrust diagonally upwards and backwards through the front of the thorax. By means of the eye of a sewing needle, the projecting end of the wire is bent into a hook to prevent its release from the body. The mosquito, which should by this time have revived, is then electrocuted by placing one terminal against the wire and the other preferably against an abdominal segment. Automatically the wings assume the flight position and the legs are extended. A drop of embalming fluid placed on the hook of the wire will slowly penetrate into the puncture made by it. A drop of xylol balsam should be allowed to harden where the legs join the body to prevent the breaking off of the appendages during inspection. The wings need no extra support, and the usual procedure for mounting may be subsequently applied.

ROOT (F. M.). **Some American Species of *Phlebotomus* with short terminal Palpal Segments.**—*Amer. J. Hyg.* **20** no. 1 pp. 233–246, 5 figs., 11 refs. Baltimore, Md, July 1934.

The following is taken from the author's summary: Descriptive notes are given on the buccal armature, spermathecae and other characters of *Phlebotomus squamiventris*, Lutz & Neiva, *P. intermedius*, Lutz & Neiva, and *P. panamensis*, Shannon. *P. amazonensis*, sp. n., is described from several females collected at Iquitos, Peru, and *P. davisi*, sp. n., from a single male collected in Para, Brazil; a description is also given of females from Bahia, Brazil, which are believed to belong to the latter species.

BOYD (M. F.) & STRATMAN-THOMAS (W. K.). **The Comparative Susceptibility of *Anopheles quadrimaculatus* Say, and *Anopheles crucians* Wied. (Inland Variety) to the Parasites of Human Malaria.**—*Amer. J. Hyg.* **20** no. 1 pp. 247–257, 7 refs. Baltimore, Md, July 1934.

In view of the widespread distribution of *Anopheles quadrimaculatus*, Say, and *A. crucians*, Wied., experiments were undertaken to test their relative susceptibility to infection with malaria parasites by simultaneously applying a batch of each species to an infected man. In experiments with *Plasmodium vivax*, in one case in which the gametocyte count was relatively high, both species were infected in equal proportions; on the other hand, when the gametocyte density was low, no examples of *A. crucians* became infected, although a high proportion of *A. quadrimaculatus* showed parasites. With *P. malariae*, *A. crucians* never became infected, although nearly one-fourth of the examples of *A. quadrimaculatus* showed parasites and no lot gave negative results. With *P. falciparum*, all batches of *A. quadrimaculatus* were positive in some degree, but again *A. crucians* only became infected when the gametocyte density was high. Dissection showed that, with either *P. vivax* or *P. falciparum*, even in the most heavily infected individuals of *A. crucians* the number of cysts was less than ten, whereas in *A. quadrimaculatus* there were nearly always more. It thus appears that *A. quadrimaculatus* is more susceptible than *A. crucians* to all three parasites. This finding, together with its greater tendency to remain near dwellings and to feed on human blood, explains why the former species is of greater importance than the latter in the propagation of malaria in the south-eastern United States.

WALDEN (B. H.). **Fleas and their Control.**—*Circ. Conn. agric. Exp. Sta.* no. 97 pp. 37–42, 2 figs. New Haven, Conn., February 1934. [Recd. August 1934.]

An account is given of the commoner fleas attacking man, domestic animals and poultry in Connecticut, with notes on their control.

EWING (H. E.). **The Identity and proper Scientific Name for the Sucking Louse of North American domesticated Pigs.**—*Proc. helminth. Soc. Wash.* **1** no. 2 pp. 65–66. Washington, D.C., 7th August 1934.

The louse that occurs in Europe on the wild boar (*Sus scrofa*) and probably on certain domestic pigs is shown to be specifically distinct from the louse of Asiatic wild pigs and domesticated breeds derived

from them. The identity of *Haematopinus suis*, L., which was apparently described from a domestic pig, cannot be determined, but the author considers that the name should be used for the former species. Fahrenholz, in a paper already noticed [*R.A.E.*, B **9** 19], restricts the name *H. suis suis* to the form occurring on *S. scrofa*, and it is probable that some forms found on domestic pigs in Central Europe are only varietally distinct from this. The valid name for the latter species then becomes *H. adventicius*, Neum., which was described in 1911 as a subspecies of *H. suis* and the type host of which was fixed by Fahrenholz as *Sus vittatus*, the wild pig of Sumatra. *H. suis chinensis*, Fahrenh., and *H. s. germanicus*, Fahrenh. [*loc. cit.*], described from pigs of Asiatic origin, are now considered to be subspecies of *H. adventicius*, and the author concludes from examination of several batches of pig lice in the United States that the form commonly found on domestic pigs in that country is *H. a. chinensis*.

Séguy (E.). **Les moustiques de la forêt de Fontainebleau et de la Vallée du Loing. II. Biologie et moyens d'action contre ces insectes.**—*Trav. Ass. Nat. Loing* fasc. 5 pp. 19–93, 7 pls., 31 figs., many refs. Moret, 1931. Also as *Trav. Lab. Ent. Mus. nat. Hist. nat.* **1** no. 63. Paris, 1933.

This paper is divided into three parts, dealing respectively with the general biology of mosquitos, with the particular biology of 8 species of different types to which all of the other 28 species found in the Valley of the Loing may be referred, and with measures of control. The domestic species in this locality are *Anopheles maculipennis*, Mg., *Theobaldia annulata*, Schr., and *Culex pipiens*, L. A brief review of mechanical and chemical means of destroying adults, eggs and larvae of mosquitos is included in the last part, which consists mainly of a detailed account of their natural enemies, both plants and animals.

Séguy (E.). **Les diptères suceurs de sang parasites spécifiques des oiseaux de la Forêt de Fontainebleau.**—*Trav. Ass. Nat. Loing* fasc. 6 pp. 78–107, 2 pls., 11 figs., 4 pp. refs. Moret, 1932. Also as *Trav. Lab. Ent. Mus. nat. Hist. nat.* no. 64. Paris, 1933.

Notes are given on the appearance and habits of the 46 species of flies known to attack birds in the region of the Forest of Fontainebleau. They are dealt with in three groups : those that suck blood in the adult stage, all of which are Hippoboscids, those that suck blood in the larval stage, and those that often infest birds that have previously been injured by members of one of the other two groups. A list of birds, showing their parasites and commensals, is appended.

Papers noticed by Title only.

Kröber (O.). **Catalogo dos Tabanidae da America do Sul e Central, incluindo o Mexico e as Antilhas.**—*Rev. Ent.* **4** nos. 2–3 pp. 222–276, 291–333, 6 pp. refs. Rio de Janeiro, 1934.

Schwardt (H. H.). **Biological Notes on** *Goniops chrysocoma* **(O.S.) (Diptera : Tabanidae).**—*J. Kansas ent. Soc.* **7** no. 3 pp. 73–79, 11 refs. McPherson, Kans., July 1934.

Herrick (G. W.) & Griswold (G. H.). **Common Insects of the Household.**—*Cornell Ext. Bull.* no. 202 (revd.) 62 pp., 41 figs., 7 refs. Ithaca, N.Y., N.Y. St. Coll. Agric., April 1934. [Recd. August 1934.]

Dyer (R. E.). **Endemic Typhus Fever. Susceptibility of Woodchucks, House Mice, Meadow Mice** [*Microtus*] **and White-footed Mice** [*Peromyscus*].—*Publ. Hlth Rep.* **49** no. 25 pp. 723–724. Washington, D.C., 22nd June 1934.

van Meirhaeghe (A.). **Aperçu d'ensemble sur les fièvres exanthématiques attribuées au genre** *Rickettsia*.—*Rev. belge Sci. méd.* **6** no. 1 pp. 37–68, 143 refs. Brussels, January 1934.

Watson (Sir M.). **Tropical Hygiene and Malaria Control on Mines at various Elevations. (With Discussion.)**—*Trans. Instn Min. Metall.* 42nd Sess. pp. 306–354, 4 pls., 4 figs. London [? 1934]. [*Cf. R.A.E.*, B **21** 183.]

Rode (P.). **Contribution à l'étude des mammifères vecteurs de la peste, détermination de quelques espèces** [descriptions of 5 rodents, with biological notes on three of them].—*Ann. Méd. Pharm. colon.* **32** no. 2 pp. 268–272. Paris, 1934.

Corradetti (A.). **Sui Nycteribiidae della Campagna Romana.**—*Riv. Malariol.* **13** no. 3 pp. 338–352, 2 pls., 8 refs. Rome, 1934. (With a Summary in English.)

Austen (E. E.). **Two new Oestridae (Diptera) parasitic in African Antelopes** [*Gedoelstia impolita* from Zululand and *Oestrus regalis* from the Anglo-Egyptian Sudan].—*Ann. Mag. nat. Hist.* (10) **14** no. 80 pp. 242–250, 2 figs. London, August 1934.

[Olenev (N. O.) & Sorokoumov (G. I.).] **Оленев (Н. О.) и Сорокоумов (Г. И.). Eine neue Zeckenart der Gattung** *Ixodes* **(Ixodidae) aus dem südöstlichen Kazakstan (Turkestan).** [*Ixodes kazakstani*, sp. n., from south-eastern Kazakstan (description of female taken in June 1932 on the clothing of man).] [*In Russian and German.*]—*Rev. Microbiol.* **13** no. 1 pp. 73–74, 1 fig. Saratov, 1934.

List of Publications on Indian Entomology, 1930–1932.—*Misc. Bull. Coun. agric. Res. India* nos. 1–3, 45, 27, 36 pp. Delhi, 1934. Price 1*s.* 6*d.*; 10*d.*; 1*s.* 3*d.*

Raden Mochtar & Walandouw (E. K.). **Een variëteit van** *A. gigas*. **(Uit Sumatra's Westkust.)** [An unnamed Variety of *Anopheles gigas*, Giles, from the West Coast of Sumatra.]—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 15 pp. 932–935, 5 figs., 6 refs. Batavia, 17th July 1934.

Kündig (A.). **Een variëteit van** *A. gigas* **uit Noord-Celebes.** [An unnamed Variety of *Anopheles gigas*, Giles, from North Celebes.]—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 15 pp. 935–938, 3 figs. Batavia, 17th July 1934.

Womersley (H.). **A Revision of the Trombid and Erythraeid Mites of Australia with Descriptions of new Genera and Species.**—*Rec. S. Aust. Mus.* **5** no. 2 pp. 179–254, 235 figs., 18 refs. Adelaide, 31st July 1934.

Townsend (C. H. T.). **New Neotropical Oestromuscoid Flies.**—*Rev. Ent.* **4** no. 3 pp. 390–406. Rio de Janeiro, September 1934.

Among the new genera erected are *Progastrophilus* for *Gastrophilus pecorum*, F., and *Haemorrhoestrus* for *G. haemorrhoidalis*, L.

Carew (J.). **A Blowfly Specific.**—*Qd agric. J.* **41** pt. 6 p. 591. Brisbane, 1st June 1934.

The following formula is recommended for making an antiseptic and curative dressing for use on sheep attacked by blow-flies, since it should afford protection to prevent maggots developing from a future strike, is reasonably cheap, and can be successfully removed from the wool by the manufacturer : 40 per cent. Shell Dieselene Oil or Vacuum 28–38 fuel oil, 55 per cent. herring or cod oil, 5 per cent. cresylic acid and 0·1 per cent. sodium arsenite. To make 5 gals., 22 pints cod oil and 1 oz. sodium arsenite should be shaken together in a 5–gal. drum ; the cresylic acid and fuel oil should then be added. In cold weather, at least some of the cod oil should be heated before the sodium arsenite is added to it. The mixture, which should be well shaken before and during use, should be applied with a brush or swab.

Lombard (C.). **Parasites et cancer.**—*Rev. vét.* **86** pp. 361–382. Toulouse, July 1934.

In the course of this review of the literature on the animal and vegetable parasites that may possibly be connected with cancer, reference is made to the Arthropods that have been thought to be concerned.

Totze (R.). **Blutsaugen unter rein experimentellen Bedingungen.** [Blood-sucking under purely experimental Conditions.]—*Zbl. Bakt.* (1) Orig. **132** no. 5–6 pp. 382–384, 1 fig., 1 ref. Jena, 3rd September 1934.

A description is given of an apparatus used in experiments already noticed [*R.A.E.*, B **21** 188] for feeding ticks on blood through a cellophane membrane. Provision is made for keeping the blood at a regulated temperature. Notes are included on its successful use for feeding *Culex pipiens*, L., *Stomoxys calcitrans*, L., and the fleas, *Pulex irritans*, L., *Ctenocephalides* (*Ctenocephalus*) *canis*, Curt., and *Ceratophyllus fasciatus*, Bosc.

Kirk (J. B.). **Malaria in Mauritius.**—*Trop. Dis. Bull.* **31** no. 8 pp. 521–537, 8 refs. London, August 1934.

A concise description is given of Mauritius, its topography, climate, population, housing, etc., together with an account of the history of malaria in the Island and the attempts that have been made to control it [*R.A.E.*, B **12** 77, etc.]. At the present time, the disease occurs in three regions, in each of which conditions are characteristic, *viz.*, the town of Port Louis and its environs, the coastal lowlands and the central elevated plateau. In Port Louis, malaria is connected with an excessive and unregulated domestic water supply, a large amount of which runs to waste, and with uncontrolled flood waters from the surrounding hills, which cause flooding in the town itself as well as further upstream. The only measures that would be permanently effective

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would be the regulation of the domestic water supply and the conversion of the lower parts of the adjacent valleys into lakes by means of dams, so that the flood water could be gradually discharged through sluice gates in controlled quantities. At the moment, the cost renders such major works impossible, and such palliative measures as the clearing of drains, oiling, filling and the administration of quinine are the only ones that can be applied. In the coastal lowlands, the climate is favourable to the breeding of mosquitos throughout the year, and their abundance varies with the number of rainy days per month. The population is scattered, so that the cost of instituting control measures would be prohibitive. On the other hand, such measures may well be undertaken in the high central plateau, where the population is dense and the distribution and numbers of Anophelines are restricted during the cool dry season. The abolition of all serious permanent mosquito breeding-places and the treatment of all collections of water likely to become temporary ones is being undertaken over areas within a radius of a half a mile of two given localities ; when these areas have been thoroughly treated, the radius will be extended, until eventually the whole area will have been dealt with.

Aziz (M.). **The Anopheline Mosquitoes of Cyprus.** —*Hlth Dep. Papers* (*Cyprus*) no. 4, 32 pp., 10 figs., 7 refs. Nicosia, 1934. Price 1*s*.

The Anophelines that have been recorded from Cyprus are *Anopheles maculipennis*, Mg., *A. sacharovi*, Favr (*elutus*, Edw.), *A. claviger*, Mg. (*bifurcatus*, auct.), *A. hyrcanus*, Pall., *A. algeriensis*, Theo., *A. superpictus*, Grassi, and *A. multicolor*, Camb., but the author considers it probable that the species previously identified as *A. maculipennis* is in reality *A. sacharovi*. Brief notes are given on the morphology, synonymy and bionomics of these species, and their relation to malaria is discussed.

A. claviger breeds throughout the year in wells, cisterns and other clean water close to habitations, as well as in cool shaded streams and marshes. It is responsible for most of the cases of malaria that occur in towns, in many villages in the plains that are not situated near any marsh or river and in villages in the hills near streams. Its importance as a vector is somewhat reduced by the fact that it does not fly far from its breeding-places, so that only those persons sleeping close to one are bitten ; moreover, there are seasons when the wells are in constant use, and the opportunities for breeding are limited. Although no dissections of this species have been carried out in Cyprus, there is no doubt that it is a vector, as malaria occurs in places where it is the only Anopheline. Although good results may be obtained with the co-operation of the inhabitants in the suppression of its domestic breeding-places, the problem of its control has not yet been solved, for in certain seasons and places it may breed in the open in the rural parts of the Island.

A. superpictus is regarded as the next most important vector. As soon as the rains cease (about the latter half of March), the larvae are found in any stream exposed to the sun, and breeding continues until the water dries up or they are swept away by the autumn and winter rains. During the short cold season, the adults occur in houses, particularly in rooms where there is no smoke, and in stables. Larvae may be found even in winter in natural breeding-places, if there is no rain to wash them away. Most of the villages are situated near

river beds and malaria is severe. In such places *A. superpictus* is the predominating Anopheline, although a few examples of *A. claviger* may be associated with it in the hills, or a few of *A. sacharovi* in the plains.

A. sacharovi breeds in fresh or brackish water in marshes and in other collections of sluggish water, particularly in the plains. There is no doubt that drainage work has been the chief factor in reducing malaria in the plains by diminishing the numbers of *A. sacharovi*, which would otherwise be the most important vector. Apart from a number of isolated centres situated near large marshes, there are few places now left where it can be found in years with normal rainfall, although temporary breeding-places may be created in various ways. Winter flood water is stored in reservoirs in some districts, and unless these are properly constructed and maintained and are emptied in good time, they become such an important source of Anopheline breeding that this outweighs any benefit obtained from irrigation. *A. multicolor* is rare, but has been reported as a malaria vector elsewhere. It has a long range of flight, enters houses and bites man. It breeds in slightly brackish water from April to September. *A. hyrcanus* does not appear to fly far, but will bite in the vicinity of marshes even in sunlight. The author was bitten by *A. algeriensis* near the marsh in which it was found, but the importance of these last two species in the transmission of malaria is not known.

A list is given of the 21 species of mosquitos that have been recorded from Cyprus, chiefly by the author.

De Meillon (B.). **South African Simuliidae. Part I.**—*Publ. S. Afr. Inst. med. Res.* no. 33, pp. 253–263, 9 figs., 1 ref. Johannesburg, June 1934.

Descriptions are given of the male, female and pupa of *Simulium debegene*, sp. n., from the Transvaal, and of the pupa and male hypopygium of *S. nigritarsis*, Coq., from Cape Province.

De Meillon (B.). **The Eggs of some South African Anophelines.**—*Publ. S. Afr. Inst. med. Res.* no. 33, pp. 272–287, 26 figs., 3 refs. Johannesburg, June 1934.

The eggs of the following species of *Anopheles* are described from specimens obtained from females isolated in test tubes: *A. cinereus*, Theo., *A. longipalpis*, Theo., *A. marshalli*, Theo., *A. funestus*, Giles, *A. funestus* subsp. *leesoni*, Evans, *A. demeilloni*, Evans, *A. theileri*, Edw., *A. ardensis*, Theo., *A. gambiae*, Giles, *A. pretoriensis*, Theo., and *A. rufipes*, Gough. The eggs of *A. funestus* and subsp. *leesoni* were found to be easily distinguishable, and as fully developed eggs dissected from the female can be identified with certainty, a satisfactory means is now available for determining the percentage of the species and subspecies that occur in houses and the part played by each in the transmission of malaria [*cf. R.A.E.*, B **21** 133].

De Meillon (B.). **The Pupae of some South African Anophelines, hitherto undescribed.**—*Publ. S. Afr. Inst. med. Res.* no. 33, pp. 289–307, 14 figs., 6 refs. Johannesburg, June 1934.

Descriptions are given of the pupae of *Anopheles cinereus*, Theo., *A. natalensis*, Hill & Haydon, *A. ardensis*, Theo., *A. listeri*, De Meillon, and *A. squamosus* var. *cydippis*, De Meillon.

D'Hooghe (M.). **Contribution à l'étude de l'onchocercose humaine dans l'Uélé.**—*Ann. Soc. belge Méd. trop.* **14** no. 2 pp. 153–180, 18 refs. Brussels, 30th June 1934.

In Uele (Belgian Congo), *Simulium damnosum*, Theo., and unidentified species of the genus have been found. The author does not consider the theory that the bites of Simuliids attract the microfilariae of *Onchocerca* to the site of the bite [*R.A.E.*, B **20** 169; **21** 65] is necessary to explain the infection of the flies, since an examination of natives with cysts of *Onchocerca volvulus* showed that their skin is swarming with microfilariae. Developmental forms of *O. volvulus* were found in the thoracic muscles of dissected Simuliids on several occasions.

Vincke (I.) & Henrard (C.). **Note sur la lutte antipaludique à Léopoldville.**—*Ann. Soc. belge Méd. trop.* **14** no. 2 pp. 203–217, 2 graphs, 3 refs. Brussels, 30th June 1934.

Of 6,116 adult Anophelines caught in various parts of Leopoldville during 1932, 5,505 were *A. gambiae*, Giles, 274 *A. coustani*, Lav. (*mauritianus*, Grp.), 218 *A. moucheti*, Evans, 55 *A. nili*, Theo., 39 *A. funestus*, Giles, 3 *A. squamosus*, Theo., 21 *A. rufipes*, Gough, and 1 *A. obscurus*, Grünb. Notes are given on the breeding-places of these species (except the last two, larvae of which were not found) and of *A. rhodesiensis*, Theo., adults of which were never taken in houses. The malaria infection index of *A. gambiae*, was determined throughout the year, the monthly average varying from 2·6 to 21·4 per cent. and the lowest occurring in June and July. The proportion infected increased with the monthly rainfall, the average temperature and the relative humidity, although infected individuals were also found in dry and cold months. The development of the malaria parasite within the mosquito was influenced not only by the average minimum temperature but also by the degree to which temperature fell at night. Infection was also found in *A. moucheti*, which was regularly obtained in catches from various parts of the town but always in small numbers, and in *A. nili*, *A. funestus* and *A. rufipes*, which were only taken singly.

Yakimoff (W. L.), Nezwettaïeff (N. W.), Rastegaïeff (E.) & Schmulewitsch (A. I.). **Die Ansteckung des Zebu mit Piroplasmiden.** [The Infection of the Zebu with Piroplasms.]—*Zbl. Bakt.* (1, Orig.) **124** pp. 465–471, 1 pl., 8 refs. Jena, 1932.

Yakimoff (W. L.), Gousseff (W. E.), Nezwetaieff (N. W.) & Rastégaieff (E.). **L'infection et la maladie des zébus provoquées par les piroplasmidés.**—*Ann. Soc. belge Méd. trop.* **14** no. 2 pp. 235–254, 2 refs. Brussels, 30th June 1934.

In the past, zebus have been considered by various Russian workers to be immune from piroplasmosis, and it has been suggested that by crossing them with local cattle the resistance of the latter would be enhanced. This supposed immunity was explained by some authors as "natural immunity" to the causal agents, an explanation that has been disproved by the authors' experiments, which showed that zebus can be infected with the common piroplasms of cattle by inoculation and, in the case of *Piroplasma* (*Babesiella*) *bovis*, also by the bites of larvae of *Ixodes ricinus*, L., that were the offspring of infected adults. Other authors have suggested that the skin of the zebu is too

thick to be pierced by ticks, or that the latter cannot cling to the short sparse hairs of its coat or are repelled by a secretion of the skin glands. Measurements, however, have shown that the skin of zebus is thinner than that of several common breeds of cattle, and the authors found 10 species of ticks on zebus in Azerbaijan, *viz.*: *Ixodes ricinus, Haemaphysalis cinnabarina punctata,* C. & F., *H. inermis,* Bir., *Dermacentor silvarum,* Olen., *D. niveus,* Neum., *Hyalomma detritum,* P. Sch., *H. d. rubrum,* P. Sch. & Olen., *H. marginatum,* Koch, *Rhipicephalus bursa,* C. & F., and *Boophilus annulatus calcaratus,* Bir.

Lewis (D. J.). **The Eggs of four Species of *Anopheles* from West Africa.**—*W. Afr. med. J.* **7** no. 4 pp. 135–136, 1 fig., 2 refs. Lagos, April 1934. [Recd. September 1934.]

Eggs of *Anopheles gambiae,* Giles, *A. funestus,* Giles, *A. pharoensis,* Theo., and *A. rufipes,* Gough, were obtained from Gadau, Northern Nigeria. They were laid by females caught in houses and placed singly in pieces of glass tubing $1\frac{1}{2}$ ins. long and 1 in. wide covered at one end with mosquito netting. These tubes were placed on wet filter paper in a covered dish, each tube being partly covered with a piece of wet cotton-wool. In this way many females were kept in a damp atmosphere in a small space, and a large proportion of them laid eggs after 1–2 days. The eggs were preserved on filter paper in sealed glass tubes wetted on the inside with a solution of 5 per cent. formalin and 1 per cent. glycerine. After six months, all had a fresh appearance except those of *A. gambiae,* many of which had turned yellow. The egg of *A. rufipes* is described, and those of the other three are compared with the descriptions given of those obtained in Uganda [*R.A.E.*, B **21** 200]. Those of *A. gambiae* and *A. funestus* are also compared with specimens obtained from Freetown, Sierra Leone.

Brown (J. Y.). **Safe Mosquito Nets for Use in Nigeria.**—*W. Afr. med. J.* **7** no. 4 pp. 147–148. Lagos, April 1934. [Recd. September 1934.]

The experiments described were undertaken with a view to finding a cotton netting that would exclude mosquitos and yet provide a freer circulation of air than that used in Government quarters, which has a mesh of 42 by 44 to the inch. Neither of the samples tested was of a mesh small enough to exclude sand-flies. The insects with which the laboratory experiments were carried out were *Aëdes aegypti,* L. (*argenteus,* Poir.) and *Anopheles gambiae,* Giles (*costalis,* Theo.). The netting was clamped to a sliding frame that formed the partition dividing a box into two compartments in one of which were mosquitos and in the other a guineapig. The latter was prevented from touching the netting by a piece of expanded metal fixed an inch away from it. The size of the netting was gauged by counting the holes falling within a superimposed square inch along a line of the warp and a line of the bobbin, the hole at the angle of the square being counted twice. In 6 experiments, using a mesh of 25 by 26, no mosquitos passed through the netting, even though in one experiment the guineapig was removed and males and females respectively were placed in the two compartments. A mesh of 20 by 21 was only tested with *A.*

aegypti, and though it excluded this species, it might not be effective against many of the smaller mosquitos common in Nigeria. A bed net of the 25 by 26 mesh netting, with several persons inside, was tested on the edge of a swamp. No mosquitos passed through the net during 6 hours, although *A. gambiae*, *A. coustani*, Lav. (*mauritianus*, Grp.), *Mansonia* (*Mansonioides*) *africana*, Theo., *Culex thalassius*, Theo., and small unidentified species of *Culex* were numerous on the outside. The author therefore considers that nets of this mesh are safe for general use.

Séguy (E.). **Contributions à l'etude de la faune du Mozambique. Voyage de M. P. Lesne (1928–1929). 13e Note—Diptères (2e partie).**—*Mem. Mus. zool. Univ. Coimbra* (1) no. 67, 80 pp., 19 figs. Coimbra, 1933. [Recd. September 1934.]

Notes are given on the relation to disease in various parts of Africa of some of the blood-sucking Diptera recorded in this and the previous part [*R.A.E.*, B **19** 133]. The species of *Glossina* taken were *G. austeni*, Newst., *G. morsitans*, Westw., and *G. pallidipes*, Austen. New species described include *Stomoxys griseola* and the Tabanid, *Pangonia leucomelana*.

Thomson (J. G.) & Lamborn (W. A.). **Mechanical Transmission of Trypanosomiasis, Leishmaniasis and Yaws through the Agency of non-biting haematophagous Flies. (Preliminary Note on Experiments.)**—*Brit. med. J.* no. 3845 pp. 506–509, 11 refs. London, 15th September 1934.

Work done by others on the part that may be played by non-biting haematophagous flies in the dissemination of organisms occurring in blood is briefly reviewed, and experiments carried out in Nyasaland, chiefly by the senior author, are described. The most important fact that emerged was that such flies can take up and deposit blood-inhabiting protozoa and spirochaetes, either by regurgitating them from the proboscis or by passing them alive in the excreta over a period of 5–6 hours.

The following is substantially the authors' summary. Non-biting haematophagous Muscids readily engorge on blood, serum, serous exudate, ulcers, sores and secretions from the nose, eyes and mouth. After a meal, some of them pass blood or serum in their numerous dejecta, which may contain large numbers of living trypanosomes, leishmania or *Spirochaeta* (*Treponema*) *pertenuis*, the causal agent of yaws. The flies have their preferred hosts. For example, *Musca spectanda*, Wied., which occurs in great abundance in Nyasaland, prefers man. It breeds very freely in human faeces, and as it also derives moisture from them, it could take up *Leishmania donovani*, which is known sometimes to occur in them. Large numbers persistently attack scratches, cuts and sores in search of food and the eyes, nose and mouth in search of fluid. *Trypanosoma brucei* in the blood of rats and dogs is readily ingested, and during a period varying from 5 minutes to 6 hours can be found alive in the numerous droplets of dejecta passed through the gut of the fly. Rats were experimentally infected by intraperitoneal injection of these dejecta, by placing a drop on a fresh cut on the ear, and by placing the dejecta on a drop of blood exuding from the bite of a Tabanid, but not by introducing them into the eye, nose and mouth. Certain flies after a feed extrude

a drop of the ingested blood containing living trypanosomes from their proboscis 5–10 minutes after a full meal. Living flagellates in cultures of *Leishmania donovani, L. infantum* (dog strain) and *L. tropica* are freely ingested by *M. spectanda* and are passed viable in the droplets of excreta for several hours after a feed. There can be no doubt that these flies could ingest the round tissue forms of *Leishmania* and pass them in a viable state either through the gut or by regurgitation to sores or mucous membranes, and that both kala-azar and oriental sore could be transmitted in this way. *S. pertenuis* passes rapidly in a viable form through the gut of *M. spectanda* and could thus easily be deposited on cuts and abrasions.

Duke (H. L.). **On the Employment of Volunteers in Trypanosomiasis Research; and on the Element of Control in Experiments with Trypanosomes and Glossinae.**—*Parasitology* **26** no. 3 pp. 315–324, 8 refs. Cambridge, 17th August 1934.

In the second half of this paper, the author discusses in detail the possible means by which a control reed-buck became infected with *Trypanosoma rhodesiense* in an experiment at Entebbe on game animals, particularly antelopes, as a reservoir of the trypanosomes of man. He concludes that it was infected from one of its companions by means of wild *Stomoxys* in an antelope enclosure [*cf. R.A.E.*, B **22** 112].

Hora (A. M.). **Notes on Mites collected from the Isle of Lewis, Outer Hebrides.**—*Parasitology* **26** no. 3 pp. 361–365, 5 refs. Cambridge, 17th August 1934.

The tick, *Ixodes tenuirostris*, Neum., is recorded on *Mus musculus*, and 16 species of mites, 11 of which are parasitic, on this mouse or *Apodemus hebridensis* or in the nests of the former.

Evans (A. C.). **Studies on the Influence of the Environment on the Sheep Blowfly *Lucilia sericata* Meig. I. The Influence of Humidity and Temperature on the Egg.**—*Parasitology* **26** no. 3 pp. 366–377, 8 graphs, 11 refs. Cambridge, 17th August 1934.

The following is the author's summary : The many factors governing the loss of water from the egg of *Lucilia sericata*, Mg., are discussed, and this loss of water is shown to be the probable cause of mortality and failure to complete development at different combinations of temperature and humidity.

[Olenev (N. O.).] **Оленев (Н. О.). Les limites septentrionales de la distribution des tiques Ixodoidea sur les continents du globe terrestre.** [*In Russian.*]—*Bull. Acad. Sci. URSS* Cl. Sci. mat. nat. 1934 no. 2–3 pp. 367–388, 2 pls., 3 maps, 59 refs. Leningrad, 1934. (With a Summary in French.)

Data on the world distribution of the 15 genera of Ixodoidea are summarised, with special reference to their northern limits. A systematic list is given of the 71 species involved, with records of the northernmost points at which they have been taken and in most instances their hosts. Of a total of 269 records, 85 are new and 135 are in the Russian Union. A general survey is given of the topography and character of the areas in which the various genera are found. Three occur near or south of the equator ; for the other 12, the

northern limit over the greater part of the world lies approximately between 50 and 60° N. Lat. and approximately coincides with the July isotherm of 15°C. [59°F.]. More northern points of occurrence have only been found near the White Sea and Lake Onega. In Asia the boundary lies considerably further south than the northern limit of domestic and wild bovines, whereas in North America these boundaries almost coincide.

[Smirnov (E.) & Kuzina (O.).] **Смирнов (Е.) и Кузина (О.). Experimentalökologische Studien an Fliegenparasiten. I. Teil.** [Experimental Studies on the Ecology of Fly Parasites. Part 1.] [*In Russian.*]—*Zool. J.* **12** no. 4 pp. 96–108, 2 graphs, 6 refs. Moscow, 1933. (With a Summary in German.) [Recd. September 1934.]

Brief notes are given from the literature on the biology of *Mormoniella vitripennis*, Wlk. In experiments in Russia, from 1 to 100 pupae of *Calliphora erythrocephala*, Mg., and *Musca domestica*, L., were placed in glass tumblers together with single pairs (male and female) of this Pteromalid for an average of about 12 days, the parasites being fed with sugar-water on cotton-wool. Each puparium was then placed in a separate test tube, and the parasites and flies that eventually emerged were counted. With an increase in the numbers of the host, there was a less rapid increase in the total number of parasites emerging. The maximum number of adults produced by one female parasite was 745, from 98 pupae of *Calliphora*.

The maximum number produced in the presence of only one host pupa was 40 from *Calliphora* and 33 from *Musca*, but 53 emerged from one of 10 pupae of *Calliphora* exposed to one pair of parasites. In experiments in which 64 and 98 pupae of *Calliphora* were exposed to one pair, only 1·47 and 3·06 per cent., respectively, gave rise to adult flies. Usually all pupae of *M. domestica* are parasitised if their number does not exceed 10 per female of the Pteromalid ; from two batches of 84 pupae each, however, as many as 60 per cent. of the flies emerged. When pairs of parasites were confined with 25–70 pupae of both hosts, all or most of those of *C. erythrocephala* were attacked, whereas those of *M. domestica* were usually ignored.

All pupae that failed to reach the adult stage were eventually dissected, and some contained live or dead adults of the Pteromalid that evidently were not able to make their way out. These were very seldom found in pupae of *Calliphora*, but much more frequently in those of *Musca*. On the other hand, a considerably greater number of the pupae of *Calliphora* than those of *Musca* contained parasite larvae in a state of diapause. These were usually in pupae from which a certain number of adult parasites had already emerged. Some of these larvae were quite healthy. The eggs laid in pupae of *Calliphora* during 11 days by a female that had already oviposited for 14 days gave rise only to larvae that entered a diapause. A period of 4 months was insufficient for the completion of this state.

Tarwid (K.). **Résultats de l'enquête de M. le Dr. H. Raabe sur les moustiques domestiques en Pologne en 1924 et 1925.** [*In Polish.*] —*Fragm. faun. Mus. zool. polon.* **2** no. 19 pp. 161–179, 2 pls., 9 refs. Warsaw, 25th June 1934. (With a Summary in French.)

On the basis of notes by Dr. H. Raabe and the examination of material collected by him in 1924 and 1925, a brief survey is given

of the occurrence of domestic mosquitos in various parts of Poland, the species found being *Anopheles maculipennis*, Mg., and *Culex pipiens*, L., which were widely distributed, especially the latter, *A. claviger*, Mg. (*bifurcatus*, auct.), of which only one individual was taken, *Theobaldia annulata*, Schr., which was common, and *T. fumipennis*, Steph., and *Culex vagans*, Wied. (*exilis*, Dyar), neither of which has previously been recorded from Poland. The collection included three males of *A. maculipennis* var. *alexandrae-schingarevi*, Shing., and the characters of their hypopygia confirmed the author's view as to the status of this form [*R.A.E.*, B **22** 52]. The question of the existence of different races of *A. maculipennis* is briefly reviewed from the literature [**21** 173, 177, etc.], and the racial identity of the forms occurring in Poland is discussed, but no definite conclusions could be drawn. From Raabe's notes, the author indicates the relative frequency of occurrence of *A. maculipennis* in hibernation quarters, all of which were cellars, in the different parts of the country. The results do not show a correlation between its prevalence and that of malaria.

Nieschulz (O.). **Ueber die Vorzugstemperatur von** *Stomoxys calcitrans*. [On the preferred Temperature of *S. calcitrans*.]—*Z. angew. Ent.* **21** no. 2 pp. 224–238, 2 figs., 7 refs. Berlin, August 1934.

A detailed account is given of experiments, carried out in Holland, on the temperature preferred by *Stomoxys calcitrans*, L., the results of which confirm those already noticed [*R.A.E.*, B **21** 187, 281; **22** 22].

Karny (H. H.). **Biologie der Wasserinsekten.** [The Biology of Aquatic Insects.]—Med. 8vo, xvi + 311 pp., 160 figs., 13 pp. refs. Vienna, F. Wagner, 1934. Price *RM.* 16.

This is designed to be a text-book and work of reference. A general account is given of the various types of water in which aquatic insects occur, their morphology and biology, and the technique of observation and of the collection and preparation of specimens. The main part of the work comprises a review of the classification and habits of the various groups of insects that are associated with water for the whole or part of their life-cycle, the groups being divided according to the type of association. The brief section that deals with mosquitos includes notes on their relation to malaria. Indices to authors and subjects complete the volume.

Mayer (K.). **Die Metamorphose der Ceratopogonidae (Dipt.). Ein Beitrag zur Morphologie, Systematik, Oekologie und Biologie der Jugendstadien dieser Dipterenfamilie.** [Metamorphosis of the Ceratopogonidae. A Contribution to the Morphology, Classification, Ecology and Biology of the Immature Stages of this Family.]—*Arch. Naturgesch.* (N.F.) **3** no. 2 pp. 205–288, 93 figs., 85 refs. Leipzig, 24th August 1934.

In the first part of this paper, the morphology of Ceratopogonid larvae and pupae is studied, attention being directed to the importance of the pharyngeal skeleton of the former as a character for classification. In the second, a new division of all genera of the family into five

groups is proposed, and keys are given to the immature stages. Sections on ecology and biology include descriptions of the various biotopes with the species found in them and of various adaptations to given biotopes, a report on feeding based on intestinal examination, and notes on parasites, symbionts and natural enemies.

ROUBAUD (E.) & MEZGER (J.). **Influence du sang d'oiseau sur la fécondité du moustique commun,** *Culex pipiens* **L.**—*Bull. Soc. Path. exot.* **27** no. 7 pp. 666–668. Paris, 1934.

When fed on canaries, females of *Culex pipiens berbericus*, Roub., and *C. p. autogenicus*, Roub. [*cf. R.A.E.*, B **21** 266] laid averages of 187 and 124 eggs each. When fed on man, they laid averages of 58 and 51·5 respectively. Thus the fecundity of the former was more than three times and of the latter more than twice as great when fed on birds, which are the preferred hosts of all races of *Culex pipiens*, L.

TREILLARD (M.). **Humidité et longévité dans la biologie et le pouvoir pathogène, en Indochine méridionale, de** *Myzomyia minima* **et** *Pseudomyzomyia vaga*.—*Bull. Soc. Path. exot.* **27** no. 7 pp. 668–670. Paris, 1934.

Anopheles minimus, Theo., is the most important vector of malaria in Indo-China, whereas *A. vagus*, Dön., which also frequents human habitations in considerable numbers, particularly at the time of its greatest prevalence during the rainy season, is relatively seldom found to harbour malaria parasites. The latter has been infected experimentally in comparatively high proportions and in houses is commonly engorged with human blood, so that there appears to be no anatomical or physiological character preventing the biting of man or the development of the malaria parasite that would account for its lower transmitting power. This phenomenon has been explained by the suggestion that it is only feebly anthropophilous, which has recently been supported by findings regarding its maxillary index [*cf. R.A.E.*, B **21** 140]. The author considers, however, that the relatively much shorter adult life of *A. vagus* may be a factor. He found that the percentages of *A. minimus* living more than two, three and four weeks were 26, 10 and 4 respectively, whereas those of *A. vagus* were 5, 2 and 0. Longevity was greatest in each species at the period of its maximum abundance, *i.e.*, during the dry season and the rainy season respectively. The difference in the seasonal prevalence has been explained on the basis of the seasonal periodicity of breeding-places, *A. minimus* breeding in the clear water found in streams during the dry season and *A. vagus* in collections of water containing an abundance of organic matter. The author suggests that the difference in larval nourishment may explain the difference in longevity, since the unpublished results of experiments with another species of mosquito indicated that individuals reared on food rich in proteins lived for a shorter period. The difference in seasonal prevalence may also be explained by different humidity requirements, since in the laboratory *A. minimus* was able to withstand a lower relative humidity than that occurring in nature at the end of the dry season (30 per cent.), whereas *A. vagus* showed a high mortality below 70 per cent.

Gaschen [H.]. **Prospection entomologique au Laos.**—*Bull. Soc. méd.-chir. Indochine* **12** no. 5 pp. 533–540. Hanoi, 1934.

The climate and geology of a region of south-western Laos (Indo-China), which are described, indicated that the Anopheline fauna would be similar to that of Tonkin, and this was confirmed by the finding of all but the three rarest of the fourteen species recorded from the latter region [*R.A.E.*, B **21** 190]. *A. minimus*, Theo., which is probably the chief vector of malaria, is found in all the mountainous districts, breeding in the clear partly shaded water from springs. It never occurs near the Mekong River, in its tributaries, the waters of which are rendered unsuitable by an admixture of silt from the erosion of their banks, or in stagnant pools, which harbour *A. hyrcanus* var. *sinensis*, Wied., *A. vagus*, Dön., *A. barbirostris*, Wulp, *A. splendidus*, Koidz. (*maculipalpis*, auct.), and *A. maculatus*, Theo. The last-named, which is another possible malaria vector, is present throughout the Mekong Valley. It breeds in the pools left along the edges of the river when the water is low, and when the river rises it continues to breed in the collections of rain water that persist throughout the rainy season in the flat country bordering the banks. The most important factor necessary for its development is a high degree of insolation, a condition that is easily satisfied in the river valley, particularly near towns. Experiments undertaken in Laos and Tonkin indicate that stream banks should be planted with bushes to prevent breeding. *A. culicifacies*, Giles, which occurs in northern Laos [**22** 32, 63], where it is suspected of being a malaria vector, was not taken in this region. None of the species found was infected, but this may have been due to the fact that no malaria survey had been undertaken to indicate places where infected mosquitos were most likely to be taken.

Morin (H. G. S.) & Carton (P.). **Contribution à l'étude de l'influence des facteurs climatiques sur la répartition de l'endémie palustre en Indochine.**—*Bull. écon. Indochine* **37** pp. 459–480, 5 pls., 27 refs. Hanoi, 1934.

The author discusses the influence of climate on the health of the white races, with particular reference to its importance in determining the distribution of malaria in Indo-China. He points out that there are indications of a direct effect on the distribution of certain species of Anophelines and on the development of the malaria parasite in them. On the other hand, in certain places, such as the north-east frontier region [*cf. R.A.E.*, B **22** 89], the distribution of the disease does not appear to be related to these factors, and the authors consider that it may be explained by the direct effect of a more favourable climate in producing an increased resistance in man.

Strickland (C.) & Gibson (D.). **"Backdoor Drainage," an Anti-malarial Measure designed to meet a particular Physiological Situation in Sylhet District, Assam.**—*Indian med. Gaz.* **69** no. 8 pp. 432–437, 9 figs., 2 maps. Calcutta, August 1934.

Silt deposited by one stream may block the outlet of another, which then ceases to exist above ground, and swamps and lakes are formed behind the obstruction. Mosquitos including *Anopheles minimus*, Theo. (*funestus*, auct.), *A. aconitus*, Dön., and *A. philippinensis*, Ludl., were found breeding in a lake formed in this way

in a tea garden in Assam. Drainage by cutting through the bank of silt obstructing the outflow would have been useless, as the drain would have been blocked by silt from the original source, but, following a survey in 1926, success was achieved by cutting a drain at the side of the lake and thus leading the water into a shallow valley that drained into an active stream. The few remaining depressions were filled in, and the shallow bed of the lake used for rice cultivation. The spleen indices in two parts of the lines were 58·8 and 52·5 in 1923 and 25·71 and 11·62 in 1934.

MURPHY (R. A.). **Anti-malarial Work on a Group of Tea Estates in South Sylhet.**—*Indian med. Gaz.* **69** no. 8 pp. 437–439, 1 graph, 1 ref. Calcutta, August 1934.

A brief account is given of further successful results that have been obtained in the control of Anophelines on the three tea gardens already discussed [*R.A.E.*, B **20** 196] and on six others in South Sylhet on which the same measures have recently been adopted.

GEORGE (P. V.) & WEBSTER (W. J.). **Plague Inquiry in the Cumbum Valley, South India.**—*Indian J. med. Res.* **22** no. 1 pp. 77–104, 2 pls., 1 map, 3 graphs, 19 refs. Calcutta, July 1934.

In the Cumbum Valley, Madura District, Madras, where the only industry is agriculture and several markets are held weekly, so that large quantities of grain are transported from place to place, plague occurs throughout the year, but is less prevalent in the second quarter. A continuous rat-flea survey carried out during the three years 1931–33 showed that *Mus* (*Rattus*) *rattus* is very prevalent in dwellings in the villages. The gross flea index was 4·3. Usually there were more fleas on each rat in the cold weather. The monthly index for *Xenopsylla astia*, Roths., varied from 2·1 to 0·6 but was usually between 1 and 2, whereas that for *X. cheopis*, Roths., varied from 5·1 to 1·4, the figures between March and August inclusive not being higher than 3. Graphs of the *X. cheopis* index and the number of deaths from plague do not show that the latter is directly dependent on the former, and it is suggested that the explanation of this is that fewer infected fleas become infective under unfavourable conditions, the actual index being of less importance provided that it is above a certain limit (probably about 1).

To determine the longevity of infected fleas, guineapigs from which fleas had been removed were allowed to run loose in houses overnight, and uninfested rats tethered by a piece of wire about 4–5 ft. long were left in burrows for the night. When possible, the test was repeated a week later and occasionally in several successive weeks. A total of 1,196 fleas was recovered from the guineapigs and 2,018 from the tethered rats. The fleas, which were a mixture of *X. cheopis* and *X. astia*, were tested for plague infection either culturally or by injecting them as an emulsion into rats. Usually the whole catch from one house or burrow was emulsified and a part of the emulsion was injected into two or more rats. The animals used to trap the fleas were also isolated for observation. A note was kept of the period between the finding of the last rat that had died from plague and the detection of plague infection by the above means. Out of the 196 tests, 41 gave positive results; in one case the interval was 13 weeks and in seven cases 3–5 weeks, and in the remainder it was not more than 20 days from the

finding of the last dead rat. As it could not be established whether these fleas were in a starved condition or were obtaining at least occasional feeds from surviving rats or other hosts, a series of tests was designed to determine the longevity of starved plague-infected fleas. It was found that they were able to transmit infection after 29 days of starvation when the mean room temperature was about 79°F. The fact that seven cases of resolving plague occurred (four of which were confirmed by animal passage), although no such lesions had been observed in rats inoculated cutaneously or subcutaneously with spleen emulsions, suggests that the virulence of plague infection may be reduced in starved fleas. Another case of resolving plague confirmed by animal passage was observed in a rat 57 days after it had been injected with an emulsion of two *X. cheopis*.

In trapping operations in the villages, *M. rattus* was by far the commonest rodent, but other small mammals were taken occasionally and some of these were examined for fleas. *X. cheopis* was found only on *Bandicota* sp. (index 3·1) and on *Gunomys kok* (index 0·1), these rodents being sometimes trapped in houses. Wild rodents that had died of plague were observed, and a few that were infected by injection all died of acute plague. The unimportance of wild rodents as a reservoir of plague in the Cumbum Valley appears to be explained by the fact that they generally harbour few fleas and do not attract *X. cheopis*. At the same time, they are highly susceptible and occasionally die from plague in nature. A few observations made on the climatic conditions in rat burrows showed that temperature was not much affected by the diurnal variations of outside temperature and that saturation deficiency varied only from 0·11 to 0·14 ins. whereas that outside the burrows varied from 0·65 to 0·19 ins.

As the Cumbum Valley has been an endemic centre of plague for some years, it has been assumed that the daily transport of rice and other grains from this area into Travancore was responsible for the introduction of plague into that centre. The total catch of fleas in 8 experiments in which guineapigs were released in a dozen grain carts in series on different days was, however, only one example of *Ctenocephalides felis*, Bch. Although the unloading of the grain bags has been watched on numerous occasions, rodents were rarely seen and no fleas were obtained from them. Observations have shown that heat either from the sun or in hot air chambers cannot be relied on to destroy fleas in bags of grain. Apparently satisfactory results have been obtained from the fumigation of rat burrows with Cyanogas calcium cyanide, but further observations are necessary before the exact value of fumigation can be assessed. Notes are given on the technique used in fumigating.

Buffalo Fly Control in north-west Queensland.—*Qd agric. J.* **42** pt. 1 pp. 71–82, 13 figs. Brisbane, 1st July 1934.

An account is given of the introduction of *Lyperosia exigua*, de Meij. (buffalo fly) into Australia and its subsequent spread, together with notes on its bionomics. To prevent the eastward spread of the fly from north-west Queensland, a spraying plant with a race, similar to that erected in Western Australia [*R.A.E.*, B **20** 85], has been constructed at the railhead of the main stock route from the infested area. As flies from cattle in the receiving yards may re-infest the

sprayed cattle, it is essential that the latter should be placed in trucks and removed as soon as possible while thoroughly wet. For this reason, long hoses with adjustable nozzles are used to spray the cattle in the trucks a second time and they are then moved immediately. Inspections of cattle trains have been made at various places on the way, the first being made 30 miles down the line, and the fly has never been found after the double treatment, although dead flies have been recovered from beasts after the first treatment. If possible, the trucks are treated with superheated steam at a pressure of 160 lb. to the square inch by means of an engine with steam pipes fitted to the steam box to destroy any eggs or larvae in the manure. Where this efficient device was not available, the trucks were treated with concentrated borax solution. It has been found satisfactory to treat horses and camels with the hoses only, as the race is not suitable for these animals.

Taylor (F. H.). **A Check List of the Culicidae of the Australian Region.**—*Serv. Publ.* (*Sch. publ. Hlth trop. Med.*) *Dep. Hlth Aust.* no. 1, 24 pp., 1 map. Sydney, 25th May 1934.

A list is given of the mosquitos of the Australian Region (comprising the Netherlands Indies east of Wallace's line, New Guinea, Australia, New Zealand and the various island groups in the Pacific on and south of the equator). Their distribution and synonymy is shown, but synonymy originating in other regions and in certain cases generic synonymy have been omitted. No attempt has been made to give complete references for each species, but all the literature of importance and all Australian references dealing with the transmission of disease have been included so far as possible.

Kobayashi (H.). **General Survey on the Seasonal Prevalence of the House-fly in Chosen. Second Report: Research during 1929.**—*Keijo J. Med.* **5** no. 2 pp. 69–76, 20 charts. Keijo, 30th June 1934.

During 1929, further collections of flies, chiefly *Musca domestica*, L., were made in 20 localities scattered through most of the provinces of Korea. The results, which are shown in charts, confirm the conclusions already obtained regarding their seasonal prevalence [*cf. R.A.E.*, B **18** 44].

Tokunaga (M.). **A new Biting Midge from Japan (Diptera, Ceratopogonidae), with Anatomical Notes on the Larval Head-capsules and Mouth-parts.**—*Trans. Kansai ent. Soc.* no. 3, pp. 1–12, 1 pl., 5 figs., 5 refs. Osaka, November 1932.

Tokunaga (M.). **Chironomidae from Japan (Diptera), III. The early Stages of a Seashore Biting Midge** *Forcipomyia crinume* **(Tokunaga).**—*Philipp. J. Sci.* **53** no. 4 pp. 469–486, 3 pls., 15 refs. Manila, April 1934.

Descriptions are given of the larva, pupa and adults of both sexes of *Dasyhelea crinume* collected in 1930 at Seto, Japan. The immature stages are found in the rain water in the leaf-axils of *Crinum asiaticum* var. *japonicum*, which occurs along the southern coast of Japan. The adults have been found to feed on other insects. In the second

paper, further notes are given on the morphology of the pupa and larva of this Ceratopogonid, which is transferred to the genus *Forcipomyia*.

Russell (P. F.) & Eaton (L. S.). **An automatic distributing Machine for Paris Green Mixtures.**—*Philipp. J. Sci.* **53** no. 4 pp. 497–503, 2 pls., 2 figs., 8 refs. Manila, April 1934.

The authors briefly describe and illustrate an apparatus for automatically distributing Paris green on streams against Anopheline larvae. The hopper containing the dust is fixed over the stream, and the outflow from the opening in the bottom is regulated by an adjustable revolving plate rotated by a shaft from a paddle wheel in the stream below. This device is an improvement on that previously described [*R.A.E.*, B **21** 117] in that it will distribute the usual finely powdered dusts instead of being limited to such heavy mixtures as Paris green and sand.

Russell (P. F.). **A neglected early Reference to the Malaria Vector in the Philippines.**—*Amer. J. trop. Med.* **14** no. 4 pp. 339–342, 10 refs. Baltimore, Md, July 1934.

It is now generally agreed that in the Philippine Islands malaria is transmitted by mosquitos of the group comprising *A. minimus* var. *flavirostris*, Ludl., *A. mangyanus*, Banks, and *A. filipinae*, Mnlg. [*cf. R.A.E.*, B **20** 235] and occasionally by *A. maculatus*, Theo., all of which breed in streams. The fact that the disease in these Islands is in no way connected with stagnant water was not fully recognised until 1927–1930 [**16** 6; **18** 106], but in the course of a survey of references to malaria between 1898 and 1933 the author came across manuscript notes written in 1904, in which W. D. Crosby attributed malaria to Anophelines found breeding in the streams in the vicinity of Fort Stotsenburg, and E. R. Whitmore stated that 30 per cent. of 200 examples of "*Myzomyia funesta*" harboured malaria parasites, although other Anophelines were not infected. As both *A. minimus* var. *flavirostris* and *A. mangyanus* have been identified from this vicinity, "*M. funesta*" undoubtedly referred to mosquitos of this group.

Davis (N. C.). **Attempts to determine the Amount of Yellow Fever Virus injected by the Bite of a single infected Stegomyia Mosquito.**—*Amer. J. trop. Med.* **14** no. 4 pp. 343–354, 4 refs. Baltimore, Md, July 1934.

As females of *Aëdes aegypti*, L., infected with the virus of yellow fever, could not be induced to feed on defibrinated blood or serum through thin layers of semi-solid gelatine and only rarely fed through a fresh animal membrane, the experiments described were carried out by feeding them on newly-born white mice, which were ground up and titrated immediately afterwards. The extracts were injected in graded doses into monkeys (*Macacus rhesus*). There is no information available as to the time elapsing before multiplication of the virus is initiated in the mammalian host, but from analogy with bacteria it is probable that a considerable lag occurs before growth is resumed in a new environment. Quite possibly no increase of virus took place in the body of the mouse in any of these experiments.

The following is taken from the author's summary : In two experiments the titrations indicated that each mosquito injected during the act of feeding at least 100 infective doses of virus. Mosquitos from one batch, which was later used in a mouse-feeding experiment, were titrated immediately after their infecting feed and again after 10 days. A decrease in titre during the interval confirmed previous observations that yellow fever virus within the mosquito body appears not to increase but rather to diminish in quantity [*R.A.E.*, B **22** 71]. A comparison of the amounts of virus in the whole insects and in the mice on which mosquitos of the same lot had fed showed that probably about 1 per cent. of the total virus content was injected at the time of biting.

Hinman (E. H.) & Kampmeier (R. H.). **Intestinal Acariasis due to *Tyroglyphus longior* Gervais.**—*Amer. J. trop. Med.* **14** no 4. pp. 355–362, 1 fig., 13 refs. Baltimore, Md, July 1934.

The following is substantially the authors' summary : *Tyroglyphus dimidiatus*, Herm. (*longior*, Gerv.) was recovered in Louisiana from the stools of two patients with diarrhoea, and in one of these cases clinical, laboratory and autopsy evidence (following death from intercurrent pneumonia) indicated that these mites were probably responsible for the gastro-intestinal symptoms. The same species was recovered in large numbers from the faeces of a dog with an intense diarrhoea, and the elimination of mites from its diet caused the disappearance of all evidence of intestinal irritation. It is believed that the mites are unable to establish themselves in the alimentary tract for very long periods and that the symptoms result from their long continued ingestion in food. It is not known whether they are due to a toxic substance elaborated by the mite or to mechanical irritation, or whether they are an allergic manifestation. Living mites and their eggs were recovered from the faeces of experimental dogs artificially infected with these organisms. A summary of the literature of cases of human infestation by mites in the skin, intestines and urogenital tract is presented.

Usinger (R. L.). **Blood sucking among Phytophagous Hemiptera.**—*Canad. Ent.* **66** no. 5 pp. 97–100, 8 refs. Orillia, May 1934.

The author gives additional records [*cf. R.A.E.*, B **18** 91] of phytophagous Rhynchota attacking man, taken from the literature and from his own and other unpublished observations. In experiments in which *Leptocoris trivittatus*, Say, was fed on blood serum, no nymphs developed to maturity, although in some cases the first moult was successfully accomplished, and adult bugs were kept alive for 4–14 days. He concludes that the relatively rare phenomenon of blood-sucking in the normally phytophagous groups of Rhynchota may be attributed to the stimulus of artificial light or other unusual conditions of environment, to the attractive qualities of exposed liquids, mainly sweat, and to hunger. From a comparison of the composition of plant juices and blood and from the fact that some members of phytophagous groups have adapted themselves to predacious habits or shown their ability occasionally to suck the blood of mammals, it is concluded that the change is not so profound as would at first be supposed.

Skidmore (L. V.). **Acariasis of the White Rat** (*Rattus norvegicus* **form** *albinus*).—*Canad. Ent.* **66** no. 5 pp. 110–115, 1 fig., 12 refs. Orillia, May 1934.

All stages of *Myobia ratti*, sp. n., are described from *Mus* (*Rattus*) *norvegicus* in Nebraska. What appears to be the same species was described by Mégnin but attributed by him to *M. musculi*, Claparède. It caused severe irritation among experimental white rats and was also found on wild rats. The eggs are attached singly to hairs. On hatching, the mite migrates to the base of the hair, where the special case enclosing its mandibles was seen extending down along the side of the hair root into the hair follicle, apparently for the purpose of feeding. No mites could be found in the follicles themselves.

Randolph (H.). **Allergic Response to Dust of Insect Origin.**—*J. Amer. med. Ass.* **103** pp. 560–562. Chicago, 1934.

A case of asthma that appears to have been caused by material derived from a moth is described. The patient complained of asthmatic attacks over a period of three years, during which he had been investigating the Saturniid, *Hemileuca oliviae*, Ckll. He had been consequently exposed to the fine dust in the breeding cages, particularly because it was his custom to collect parasitic insects from the cages by sucking them into a small aspirator with his mouth. His skin reacted strongly to dust from the cages and from the empty egg-shells of the insect, to broken spines, etc., from the caterpillars and to dust from the floor of the laboratory.

Beaudette (F. R.), Hudson (C. B.) & Saxe (A. H.). **An Outbreak of Fowl Plague in New Jersey in 1929.**—*J. agric. Res.* **49** no. 1 pp. 83–92, 12 refs. Washington, D.C., 1st July 1934.

In this report on an outbreak of fowl plague (poultry typhus) that occurred in New Jersey in 1929, experiments are described in which attempts were made to transmit the disease from infected to healthy fowls by means of the bites of mosquitos, chiefly *Aëdes canadensis*, Theo. The negative results obtained confirm those of other workers [*cf. R.A.E.*, B **19** 237].

Merrill (M. H.), Lacaillade (C. W. jr.) & Ten Broeck (C.). **Mosquito Transmission of Equine Encephalomyelitis.**—*Science* **80** no. 2072 pp. 251–252, 4 refs. New York, 14th September 1934.

During the summer of 1933, cases of equine encephalomyelitis in New Jersey, Delaware and Virginia were found only in areas close to salt marshes. If the disease is transmitted by insects [*R.A.E.*, B **21** 155], the salt-marsh mosquitos of which there are 4 in New Jersey, *Aëdes sollicitans*, Wlk., *A. cantator*, Coq., *A. taeniorhynchus*, Wied., and *Culex salinarius*, Coq., must be considered as possible vectors. Trap records for New Jersey and Delaware showed that in the areas where the disease occurred and during the season of its greatest incidence up to 90 per cent. of the mosquitos caught were *A. sollicitans*. *A. cantator* is present in considerable numbers early in the season, but is relatively unimportant later ; the other two species make up a small percentage of the total population throughout the season. *Anopheles quadrimaculatus*, Say, and *A. crucians*, Wied., which also breed in the salt marshes, have

a much wider distribution and are therefore unlikely to be vectors of the disease. *Aëdes aegypti*, L., is rarely found so far north as the region in which the disease occurs.

The authors proved experimentally that *A. sollicitans* would transmit both eastern and western strains of equine encephalomyelitis, though being a salt-marsh mosquito it cannot be the vector of the disease in the west. The few tests made with *A. cantator* indicated that it would transmit the eastern strain, but less readily than *A. sollicitans*. *C. pipiens*, L., and *Anopheles quadrimaculatus* failed to transmit either strain. In parallel experiments in which the mosquitos had fed on guineapig brain virus suspension, transmission of western but not of eastern virus by *Aëdes aegypti* was consistently obtained. Experiments showed that, when either *A. aegypti* or *A. sollicitans* was fed on guineapigs with a low virus content in their blood, the virus was soon lost and the mosquitos did not transmit the disease. In order to act as vectors, they must be fed on infected animals at a time when the virus content of the blood is such that 0·0001 cc. or less will produce the disease when it is injected into a guineapig. In both *A. aegypti* infected with western virus and *A. sollicitans* infected with eastern virus, the virus was shown to increase 1,000–10,000 times within the mosquito. Whenever possible, at least 20 mosquitos were used in transmission tests, but in several instances 4–7 *A. sollicitans* transmitted the eastern strain to guineapigs and in one instance a single *A. aegypti* transmitted the western strain. The virus appeared to persist in at least some of the insects as long as they lived. The eastern virus was transmitted by *A. sollicitans* 33 days after the infective meal, the longest period for which sufficient mosquitos were kept alive. *A. aegypti* proved able to transmit the western strain after 63 days. Virus was shown to be present in this same batch of mosquitos 93 days after feeding, but they did not transmit the disease at this time.

Dill (R.). **Grub in the Head in Sheep in northeastern Nevada. Methods of Herding which favored Injury and Methods of Range Management which practically eliminate Losses.**—*Bull. Nevada agric. Exp. Sta.* no. 135, 12 pp., 4 figs., 1 ref. Reno, Nev., April 1934.

A brief account is given of the bionomics of *Oestrus ovis*, L., which caused severe losses among sheep on ranges in Nevada and in an adjacent region in Utah during the winter and early spring of 1933. The author points out that the use of pine tar as a repellent [*cf. R.A.E.*, B **13** 163] or the injection of larvicides [*cf.* **19** 223] would be impracticable for treating large numbers of sheep under range conditions. Probably the fly is not more common in Nevada owing to the fact that the herds are moved frequently from place to place ; consequently the maggots that have fallen to the ground have not completed the pupal stage when the herd departs to another pasture. The outbreak described occurred among sheep on drier ranges that had spent the previous summer close to the limited water supply. In some cases they had watered at the same spring and rested in the same patches of shade for 40 days or more. They became heavily infested and were either unable to withstand the hard winter that followed or died later from haemorrhages from the nose or from infections. Thus it seems probable that infestation on the Nevada ranges will not increase unless the water supply grows less and it becomes necessary to use the same shade and water for longer periods.

Baker (R. E.). **Extermination of Bedbugs on board Ship.**—*U.S. nav. med. Bull.* **32** no. 2 pp. 193–194, 1 ref. Washington, D.C., April 1934.

Bed-bugs [*Cimex*] that had persisted in spite of thorough and repeated treatments with blow torches, sprays, etc., were entirely eliminated from a compartment on board ship by closing it and maintaining the temperature at 115°F. for 3 hours by means of electric heaters.

Cook (S. S.). **Insect Control.**—*U.S. nav. med. Bull.* **32** no. 2 pp. 229–247, 7 refs. Washington, D.C., April 1934.

As much of the information on the subject of insect control is not generally available to the United States naval personnel, the author gives an account of the bionomics of mosquitos, house-flies [*Musca domestica*, L.], fleas, lice [*Pediculus* and *Phthirus pubis*, L.], bed-bugs [*Cimex*] and cockroaches, with practical methods for their control, the first three being dealt with in some detail.

Murie (A.). **The Moose of Isle Royale.**—*Misc. Publ. Mus. Zool. Univ. Mich.* no. 25, 44 pp., 7 pls. Ann Arbor, Mich., 7th July 1934.

In the course of studies on the moose of Isle Royale in Lake Superior, the author found that they suffer considerably from the attacks of biting flies, one of which was identified as *Haematobia alcis*, Snow. This fly was described in 1891 and has not been recorded in the interim.

Hoffmann (C. C.). **Contribución al conocimiento del paludismo en la península de Yucatán.** [A Contribution to the Knowledge of Malaria in the Peninsula of Yucatan.]—*Bol. Inst. Hyg. Méx.* (2) **2** no. 1 reprint 58 pp., 29 figs. Mexico, D.F., 1934.

In 1927 and 1928, the author visited the Mexican states of Campeche and Yucatan to study one of the local epidemics of malaria that occur periodically in the peninsula.

The Anophelines observed (a key to which is given) were *Anopheles albimanus*, Wied., *A. pseudopunctipennis*, Theo., *A. crucians*, Wied., *A. vestitipennis*, D. & K., and *A. punctimacula*, D. & K. Some of the data given on them are similar to those already noticed [*R.A.E.*, B **17** 73]. *A. albimanus* prefers to feed on man, and its local prevalence was related to that of malaria. Where its breeding-places were near dwellings, it represented a high percentage of the mosquitos indoors, but, owing to lack of breeding-places, it is not normally abundant in the more densely populated districts. In Mexico, it can breed in artificial collections of water, such as channels, troughs, etc., that contain algae. During the dry season only, *A. pseudopunctipennis* occurred in the same artificial collections of water. It is probable that in Yucatan it does not readily enter dwellings [*cf.* **17** 74, 217]. *A. crucians* was particularly prevalent in the mangrove areas on the coast. Its importance as a vector of malaria appears to be limited by its reluctance to leave these areas. In houses near the mangroves, it was observed throughout the year, but was not abundant. *A. vestitipennis* was found in the almost uninhabited forest region. Though it readily attacked man and apparently recent cases of malaria were observed in places where it was the only Anopheline taken, it is not believed to

be a dangerous vector. As in other parts of Mexico, *A. punctimacula* was fairly rare and was unimportant as a vector of malaria.

The second half of the paper deals with the occurrence of malaria in Yucatan and particularly with the epidemic of 1927 in the sea-port of Progreso. Of mosquitos taken indoors at Progreso, 90·8 per cent. were *A. albimanus* and 0·8 *A. crucians*, these being the only Anophelines. In 1930–32, only 0·5 per cent. were *A. albimanus* and 3·8 per cent. *A. crucians*, so that the above percentages were exceptional. The eradication of breeding-places, including partial clearance of the mangroves near the town, was successfully carried out, no breeding-places of *A. albimanus* being found in 1928.

Edwards (F. W.) & James (S. P.). **British Mosquitoes and their Control.**—*Econ. Ser. Brit. Mus.* no. 4a (2nd revd edn) 30 pp., 4 figs. London, 1934. Price 4*d*.

A certain amount of additional information on the bionomics, distribution and control of mosquitos in Britain is contained in this revised edition of a pamphlet already noticed [*cf. R.A.E.*, B **13** 186]. *Anopheles algeriensis*, Theo., is recorded from Norfolk [*cf.* **21** 24]. Two distinct races of *A. maculipennis*, Mg., are now known to occur in England; one corresponds most closely with var. *atroparvus*, van Thiel, which is common in Holland, and the other with var. *messeae*, Flni., which is widely distributed in Europe [*cf.* **22** 112]. In both varieties egg development is arrested at the end of the summer, but in *messeae* the " fat-body " is elaborated and the insect ceases to feed and hibernates completely in towers, sheds, lofts, cellars and other buildings unoccupied by man or animals, whereas *atroparvus* passes the winter in comparatively warm buildings occupied by animals, or occasionally in houses, and from time to time obtains a blood meal from the occupants. This habit would make it of importance in the transmission of malaria [**18** 53], cases of which are still reported in England from time to time.

[Olenev (N. O.).] **Оленев (H. O.). Mange Mites.** [*In Russian.*] —Demy 8vo, 64 pp., 25 figs., 58 refs. Leningrad, Izd. Akad. Nauk SSSR [Pub. Acad. Sci. USSR], 1932. Price 1 *rub.* 75 *kop.* [Recd. October 1934.]

In the first part of this manual on mites causing mange in domestic animals, poultry and man, the bionomics of the mites in general are briefly discussed, the different types of mange as manifested in the various hosts are outlined, and notes are given on the collection, preservation and examination of the mites concerned. The second part (pp. 36–52) deals with the classification of the mites, keys being given to the families, genera and species. In an appendix, parasitic mites that do not cause mange are briefly reviewed under their families.

[Olenev (N. O.).] **Оленев (H. O.) Parasites of domestic Animals in Kazakstan (Arachnoidea and Insecta).** [*In Russian.*]—Demy 8vo, 77 pp., 1 map, 35 figs., 67 refs. Leningrad, Gos. Izd. sel'skokhoz. kolkhoznokooper. Lit. [State Pub. agric. coop. Lit.], 1931. Price 1 *rub.* [Recd. October 1934.]

This is a survey of Arthropods found, chiefly on domestic animals, during expeditions to Kazakstan in 1928 and 1929 [*R.A.E.*, B **17** 154;

19 98]. They are dealt with under their orders and families, brief general accounts of the morphology and bionomics of which are given, and the local distribution, hosts and dates of capture of the species are indicated. Tables are included in which they are arranged under their hosts. Their dependence on local physico-geographical conditions is discussed, and a chapter is devoted to their economic importance and the control measures employed locally against them.

TARTAGLIA (P.). **Le kala-azar en Yugoslavie.**—*Bull. Off. int. Hyg. publ.* **26** no. 8 pp. 1371–1381, 2 maps. Paris, August 1934.

It seems probable that kala-azar existed in Jugoslavia before the recording of the first case in 1930, since when 89 have been diagnosed in the two provinces where the disease has been studied. No case of cutaneous leishmaniasis has been observed in man. Most of the infected persons came from localities on the coast, although some came from hilly regions (altitude 300–400 ft.). Of the total number of cases, 82 were children 1–12 years old, the majority being 2–4 years. Human cases occurred in houses where dogs were absent or healthy ; the one case of canine leishmaniasis (cutaneous) diagnosed was observed in a house where all the children were healthy. The possibility that *Pulex irritans*, L., *Ctenocephalides* (*Ctenocephalus*) *canis*, Curt., or *Cimex lectularius*, L., act as vectors appears to be remote, as healthy children sleeping with infected children did not contract the disease, although fleas and bed-bugs were abundant in the beds. Moreover, cases of kala-azar have occurred in which there was no possible contact with dogs or their parasites, or with bed-bugs. On the other hand, sand-flies are prevalent throughout the regions where leishmaniasis was observed. *Phlebotomus perniciosus*, Newst., is not common, but *P. papatasii*, Scop., was found in almost every house. None of the sand-flies examined from houses in which cases had occurred was infected, but this result cannot be considered conclusive until more systematic and detailed investigations have been carried out. It is considered probable that children are more often infected than adults because they spend more time in the houses, and that the disease occurs more often near the sea because sand-flies are more abundant on the coast.

KHALIL BEY (M.). **Les leishmanioses en Egypte.**—*Bull. Off. int. Hyg. publ.* **26** no. 8 pp. 1386–1392, 1 sketch map, 22 refs. Paris, August 1934.

In the course of investigations on cutaneous leishmaniasis undertaken during September-November 1933 in a locality near Zagazig, it was found that sand-flies were common in September and early October but that their numbers decreased as the weather became colder. Most of those captured were engorged examples of *Phlebotomus papatasii*, Scop., which enters houses, particularly during the last hours of darkness. Dissection of large numbers revealed no infections even in those fed on ulcers in which *Leishmania tropica* was abundant. *P. squamipleuris*, Newst., appeared about 6 or 7 o'clock in the evening, but none of the individuals captured was engorged. This species, which is attracted by artificial light, has not previously been recorded from Egypt.

Hopkins (G. H. E.). **Notes on Uganda Mosquitoes and on Methods of Control.**—*Uganda J.* **2** no. 1 pp. 49–59, 5 pls. Kampala, 1934.

A popular account is given of the various groups of mosquitos that occur in Uganda, including the species of *Anopheles* that carry malaria [*cf. R.A.E.*, B **21** 130] and *Aëdes aegypti*, L. Measures for their control are dealt with in some detail. It has been observed that roofs of thatch or corrugated iron erected on poles over wells or water-holes to keep the water cool are effective in preventing mosquito breeding.

A further Account of the Anti-tsetse Campaign in Tanganyika Territory.—*Tanganyika Standard*, 17th October 1933–1st May 1934, reprint 32 pp. Dar-es-Salaam, 1934.

This second series of papers written by members of the Tsetse Research Department of Tanganyika Territory [*cf. R.A.E.*, B **21** 163] comprises articles dealing with the following subjects : the methods of carrying out organised late grass-burnings, and of making clearings with the use of tribal labour ; the present distribution of *Glossina morsitans*, Westw., *G. swynnertoni*, Aust., and *G. pallidipes*, Aust., the most important species of *Glossina* that occur in the Territory, the reasons for their advances and the outlook for the future ; the means by which water may be provided in reclaimed areas ; the successful opening up of large areas of grazing land in the north-west Shinyanga District, by providing a fly-free route through an infested area and by making clearings to isolate the large block of ilula bush in which the fly persists only when it is in contact with an infested area ; the relation of the fly to various groups of animals and the experiments that are being carried out to determine how far control may be effected by the continued movement or discriminative control of game, as opposed to general game extermination ; the possibility of controlling the different species of *Glossina* by changing the vegetation of their habitats either by removing the elements known to be favourable or by preventing grass fires and so allowing the vegetation " succession " to reach its " climax " for the particular type of country ; and, finally, the distribution of six out of the seven Tanganyika species of tsetse in other parts of Africa and the present prospects of controlling them.

Dudley (S. F.). **Can Yellow Fever spread into Asia ? An Essay on the Ecology of Mosquito-borne Disease.**—*J. trop. Med. Hyg.* **37** no. 18 pp. 273–278, 18 refs. London, 15th September 1934.

The author discusses the question of the distribution of yellow fever, which has spread from West Africa to America but not to the east side of Africa or Asia, and suggests there may be different races of the usual vector, *Aëdes aegypti*, L., those present in the latter regions being less efficient vectors than those in the former [but *cf. R.A.E.*, B **18** 82, 198].

Thomsen (M.). **Fly Control in Denmark.**—*Quart. Bull. Hlth Org. L.o.N.* **3** pp. 304–324, 13 pls., 2 figs., 4 refs. Geneva, 1934.

Brief notes are given on the appearance and habits of *Musca domestica*, L., *Stomoxys calcitrans*, L., *Lyperosia irritans*, L., and *Haematobia stimulans*, Mg., the four common flies found in houses and on farms in Denmark. Although horse manure has previously been regarded as the principal medium in which *M. domestica* breeds, investigations on more than 100 Danish farms showed that, at least during the summer,

pig manure is preferred. Cow manure was hardly ever selected. Larvae were numerous in horse manure, but as this is much less abundant in farm manure-heaps than pig manure, especially in summer when the horses are out at pasture, it is of minor importance. No larvae occur in horse dung in fields or on roads, but they may be found in chicken and rabbit dung. Experiments were carried out in which containers of equal size filled with pig, horse, cow and calf dung respectively were exposed for 24 hours on a manure-heap swarming with *M. domestica* and in a calf-byre where *Stomoxys* was present in large numbers. The results showed that the house-fly breeds for preference in pig and horse dung, to a less extent in calf dung and not at all in that of cows, whereas the stable-fly oviposits in calf and horse dung but not in pure pig or pure cow dung, although the larvae may be found in cow dung mixed with straw and urine, in pig dung mixed with straw or in old mixed manure. The fact that both flies discriminate between cow and calf dung may be due to the effect of the milk diet of calves on the composition or the processes of fermentation of the dung. Observations that have not yet been experimentally confirmed indicate that feeding pigs on milk may render the dung more attractive to flies.

The period required for development from egg to adult ranged from 34 and 42 days at 16°C. [60·8°F.] to 7 and 10 days at 33°C. [91·4°F.] for *M. domestica* and *S. calcitrans* respectively. The pre-oviposition period at 20–22°C. [69–71·6°F.] for flies fed on milk in the laboratory was 5–6 days.

After considering the various methods that have been recommended for preventing the breeding of flies in manure-heaps, which for various reasons proved impracticable on Danish farms, the author devised two simple and apparently effective procedures. The first consists in carefully stacking the manure in compact rectangular blocks and immediately covering it with a layer of cow dung; the drawback to this method is the lack of cow dung when the cows are out at pasture, as old mixed manure and old pig manure are not effective substitutes. In the second, the pig manure, stacked as described, is covered with tarpaulins made of the discarded nitrate bags that are found on all Danish farms. As these are made of stout material and lined with tarred paper, they form a good fly-proof cover, provided that they are arranged to overlap all round. This method permits the fermentation heat of the manure to permeate the topmost layer. In pure and very liquid pig dung, the temperature seldom rises above 35–40°C. [95–104°F.], but if a certain amount of straw or horse manure is present, it reaches 50°C. [122°F.] or more at the surface and 60–70°C. [140–158°F.] at a depth of about 6 inches. Slight compression seems to promote a rise in temperature. In the course of experiments, masses of dead larvae were found on the surface of the heap when the sacking was removed. All eggs deposited on the layer of sacking by flies attracted by the smell of pig dung perish. What period must elapse before the covering can be removed without the fear of eggs being deposited is not known, but it might be possible to cover the completed stack with a layer of earth, peat litter or fresh cow manure. This method combines the prevention of oviposition with the biothermic method for destroying any maggots or pupae already present in the manure when it is covered. If stables, byres, and sties were cleaned out periodically (at least every week during the summer) and the manure-heaps kept covered, the number of flies that succeed in emerging during the year would be comparatively small.

PAPERS NOTICED BY TITLE ONLY.

PETERSON (A.). **A Manual of Entomological Equipment and Methods. Part I.**—Demy 4to [2] 21 pp., 138 pls., [12] xiii pp. Ann Arbor, Mich., Edward Bros., Inc., 1934. Price $3·75. [See *R.A.E.*, A **22** 632.]

KEMPER (H.). **Ueber die physiologische Wertbestimmung von Pyrethrumpulvern.** [On the Physiological Valuation of Pyrethrum Dusts.]—*Z. angew. Ent.* **21** no. 2 pp. 208–223, 1 fig., 3 pp. refs. Berlin, August 1934. [See *R.A.E.*, A **22** 628.]

VOGEL (R.). **Zur Kenntnis der Stechmücken Württembergs. ii. Teil.** [The Mosquitos of Wurtemberg. Part ii.]—*Jh. Ver. vaterl. Naturk. Württemb.* **89** pp. 175–186, 9 refs. Stuttgart, 1933. [Recd. September 1934.] [*Cf. R.A.E.*, B **18** 119.]

SOESILO (R.). **Een varieteit van** *A. gigas* **uit Sumatra's Westkust.** [An unnamed Variety of *Anopheles gigas*, Giles, from the West Coast of Sumatra (emendation of description).]—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 18 p. 1179. Batavia, 28th August 1934. [*Cf. R.A.E.*, B **22** 208.]

SÉGUY (E.). **Diptères de Chine de la collection de M. J. Hervé-Bazin** [including 2 new Tabanids].—*Encycl. ent.* B II Dipt. **7** pp. 1–28, 24 figs. Paris, 1934.

SÉGUY (E.). **Diptères d'Afrique** [including 4 new Tabanids]. –*Encycl. ent.* B II Dipt. **7** pp. 63–80, 12 figs. Paris, 1934.

NASH (T. A. M.). **The Efficacy of Bush Clearing as a Method of Tsetse** [*Glossina*] **Control.**—*W. Afr. med. J.* **7** no. 4 pp. 137–139, 3 refs. Lagos, April 1934. [*Cf. R.A.E.*, B **22** 173.]

DE MEILLON (B.). **A new** *Xenopsylla* [*phyllomae*, sp. n., on *Aethomys*] **from the Transvaal.** *Publ. S. Afr. Inst. med. Res.* no. 33 pp. 265–267, 2 figs., 1 ref. Johannesburg, June 1934.

DE MEILLON (B.). **A new Variety of** *Anopheles natalensis* **Hill & Haydon** [var. *puselis*, n., from the Transvaal].—*Publ. S. Afr. Inst. med. Res.* no. 33 pp. 269–271, 1 fig. Johannesburg, June 1934.

ROBIN (M.). **La prophylaxie antipaludique dans les plantations de l'Indochine méridionale. La lutte antilarvaire. Son efficacité.**—*Bull. Soc. Path. exot.* **27** no. 7 pp. 691–699. Paris, 1934. [*Cf. R.A.E.*, B **22** 175.]

SEN (S. K.). **The Sucking Apparatus in Ticks.**—*Nature* **134** no. 3391 p. 664. London, 27th October 1934.

ASCHNER (M.). **Studies on the Symbiosis of the Body Louse** [*Pediculus humanus*, L.]. **I. Elimination of the Symbionts by Centrifugalisation of the Eggs.**—*Parasitology* **26** no. 3 pp. 309–314, 1 pl., 6 refs. Cambridge, 17th August 1934.

CAMERON (A. E.). **The Life-history and Structure of** *Haematopota pluvialis*, **Linné (Tabanidae).**—*Trans. roy. Soc. Edinb.* **58** no. 10 pp. 211–250, 28 figs., 54 refs. Edinburgh, 1934.

La destruction des moustiques par les cactus épineux.—*Rev. Hort. Agric. Afr. N.* **38** no. 9 p. 250. Algiers, September 1934.

Good results in mosquito control have been obtained by means of a mucilaginous mixture made by steeping in water the chopped leaves of prickly-pear (*Opuntia vulgaris*). The mixture floats on the surface of pools and gradually obstructs the tracheae of the larvae, killing them in from 15 to 50 hours. Further, the adult mosquitos seldom oviposit on the water, and if they do, the eggs cannot develop. If the leaves are not steeped but are merely cut up and thrown into the water, the result is the same though slower. This treatment has been found as effective as oiling, and has the advantage of not affecting fish.

Nicholls (H. M.). **Fleas as Household Pests.**—*Tasm. J. Agric.* (N.S.) **5** no. 3 pp. 124–125, 1 fig. Hobart, 1st August 1934.

During the past few years, several outbreaks of fleas have occurred in houses in the country in Tasmania, the species concerned being *Pulex irritans*, L., and *Ctenocephalides* (*Ctenocephalus*) *canis*, Curt., both of which attacked dogs, cats and man. A brief popular account is given of the bionomics of fleas. The measures recommended for their control include the covering of floors with linoleum to prevent breeding in cracks, and the use of a 5 per cent. kerosene emulsion for scrubbing floors or washing infested animals. The emulsion is prepared by dissolving 2 oz. hard soap in 2 pints water, removing the boiling solution from the fire, adding 2 pints kerosene and beating until a white emulsion is formed ; the emulsion is then made up to 5 gals. with water.

Morris (K. R. S.). **The Bionomics and Importance of** *Glossina longipalpis*, **Wied., in the Gold Coast.**—*Bull. ent. Res.* **25** pt. 3 pp. 309–335, 11 figs., 2 maps, 15 refs. London, September 1934.

The following is largely taken from the author's summary : A detailed study of the bionomics of *Glossina longipalpis*, Wied., was undertaken at Takoradi, the principal port of the Gold Coast, between February and September 1931. The country is undulating, with dense, homogeneous vegetation intermediate in character between the rain forest and the savannah forest ; a few small glades occur in the forest, and large open marshes on the flatter ground. The climate is equable, with a low mean annual rainfall (40–45 inches) but constantly high humidities, owing to the sea winds. The main rainy season lasts from April to July, and the second rainy period from October to November. Although larger game is absent, other mammals are abundant. The main hosts of *G. longipalpis* proved to be bushbuck and duiker, which are ubiquitous, and when these animals were driven out of a small infested area by farming and wood cutting, the fly quickly and completely disappeared. It was never found to feed on reptiles, although they were common in the other two small isolated fly belts studied.

Meteorological observations showed consistently lower temperature and higher humidity as well as greater equability in these factors in the fly belts than in the open country. The movement of the fly into the open was greatest when the humidity was within the range normally occurring in the fly belt. By statistical methods, coefficients of correlation were determined for the fly's density-activity and various climatic factors of the fly belt. There was a high positive correlation

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with temperature and a lower negative one with humidity, of which saturation deficiency was a better index than atmometer evaporation. There was a significant correlation with sunshine, but none with rainfall. The influences of humidity and sunshine were mainly due to their effect on temperature, which was evidently of primary importance. There was a significant negative correlation with relative humidity measured with a wet and dry bulb hygrometer in a Stevenson screen in the open. All correlations were closest when the fly catches were compared with climatic readings taken at the time of capture rather than with readings taken a week previously, thus indicating that it is the activity rather than the density of the fly that is affected. The fly was inactive at temperatures below 74°F. with humidities of 80–90 per cent. The low influence of humidity may probably be explained by the fact that, during the period of observations, the range of humidities in the fly belt was uniform and well within the limits tolerated by the fly. Temperatures, on the other hand, were further from the optimum and approached the limit at which the fly becomes inactive. A marked daily rhythm was observed in the activity of the fly; it was quiescent from late afternoon until about 2 hours after sunrise, most active in the middle of the morning, quiescent again during the middle of the day, and rather more active again in the early afternoon. Except in the early morning, this rhythm is not affected by temperature or humidity.

The distribution of *G. longipalpis* in the Gold Coast is dependent upon the humidity of the ecoclimate rather than on the temperature. It occurs in three main vegetational types, transitional forest, inland savannah forest and coastal savannah, where the range of relative humidity is between 50 and 80 per cent. and temperature between 75 and 85°F. It does not occur in the rain forest, where the relative humidity is constantly above 80 per cent., or in northern savannah, where the humidity is as low as 30 per cent. in the dry season. The main breeding season was from March to July, with its maximum in May at the height of the rains.

This species was found infected with *Trypanosoma gambiense*, *T. congolense* and *T. vivax* at Takoradi [*cf. R.A.E.*, B **20** 221] and is probably second in importance to *G. palpalis*, R.-D., as a vector of sleeping sickness in the Gold Coast, but is at present of less importance than *G. palpalis* or *G. tachinoides*, Westw., in the transmission of trypanosomiasis of stock. The receding of the Ashanti Forest and the present development of the Colony may cause even closer contact between this species and man. Its control should be attempted chiefly by improving native methods of cultivating the bush. Farms should be close to villages and kept under cultivation permanently where possible. Clearings round bush villages should be 100 yds. wide and round important towns at least 200 yds. Small clearings and isolated farms are considered a danger.

SWYNNERTON (C. F. M.). **Protection of Vegetation against Grass-fires as a possible Solution for some Tsetse Problems.**—*Bull. ent. Res.* **25** pt. 3 pp. 415–430, 4 pls., 1 graph, 1 map, 12 refs. London, September 1934.

The author discusses in detail the effect on tsetse-flies of altering the vegetational complex in certain experimental plots at Shinyanga (Tanganyika) by excluding grass fires [*cf. R.A.E.*, B **22** 230].

The following is taken from his summary : In a block of 4 sq. miles infested with *Glossina swynnertoni*, Aust., and *G. pallidipes*, Aust., from which grass fires have been excluded for three years in succession, the number of flies per 1,000 yds. of transect has decreased from 9·4 to 1. Similar results have been obtained in other blocks and strips. In a control block of only $1\frac{3}{4}$ sq. miles where the grass has been burned sporadically in the native manner, the average catch per 1,000 yds. has increased from 4·2 to 13·1. In all the blocks the game is about as plentiful as at the beginning of the experiments, and slightly more so in the block of 4 sq. miles. The results of the experiments suggest that with the further advance of the vegetational succession towards its natural climax, the remaining fly population will become further reduced and eventually disappear, at least if the areas are isolated. The growing homogeneity in vegetation density will reach a point at which it is unlikely to satisfy the daily and seasonal needs of an insect that requires the three different densities furnished by thicket, savannah wooding and nearly open hard pan and vlei, for breeding, regulation of moisture and temperature, and feeding.

It is thought that this method may be effective also against *G. morsitans*, Westw., under certain conditions, although it may take longer and may not apply to large areas. Its effect on *G. pallidipes* is uncertain, but it seems likely to produce conditions favourable to *G. brevipalpis*, Newst.

Lamborn (W. A.). **Medical Entomologist's Report for 1932.**—*Annu. med. Rep. Nyasald 1932* pp. 54–60, 2 refs. Zomba, 1933. [Recd. October 1934.]

The position regarding *Glossina* [*morsitans*, Westw.] in the Northern Province of Nyasaland appeared on the whole to be satisfactory, the limits of the infested areas being for the most part the same as in 1926 In April it was found that in one locality in the Fort Manning District the fly had advanced to the south and occupied a thicket one mile by two in extent. Clearing and settlement, organised burning of undergrowth in September, and smoke fumigation of lorries traversing the area were effective in eliminating the fly, which could not be found there in October. As a precaution against re-invasion, a further stretch of country was thrown open for free shooting, the game being rapidly able to find sanctuary in the reserve to the north. A sudden and unexpected advance also occurred in the Namwera fly area, the fly appearing in some numbers in March on an estate 5–6 miles distant from the region where it is abundant. From September onwards, when the leaves had fallen and there was a consequent lack of shade, it was only taken occasionally, and after the bush fires it disappeared completely ; re-invasion took place, however, very soon after the rains broke.

Experiments on the cyclical transmission of *Trypanosoma rhodesiense*, by means of *Tabanus, Haemotopota, Stomoxys, Ornithodorus, Cimex* and larvae of *Auchmeromyia*, of *T. brucei* by means of the first five and small undetermined biting flies, and of *T. congolense* by means of *Stomoxys* all gave negative results [*cf. R.A.E.*, B **20** 263]. Direct transmission of *T. rhodesiense* was also attempted with all these Arthropods, but positive results were obtained only in two cases when *Tabanus* and *Stomoxys* respectively were used.

Poulton (W. F.). **Annual Report of the Veterinary Department, Uganda, 1933.**—Fol. 55 pp., 2 fldg. maps, 1 chart. Entebbe, 1934.

Reclamation work against *Glossina morsitans*, Westw., was continued in 1933 [*cf. R.A.E.*, B **22** 6]. In south Ankole, bush clearing was pressed forward in order to lessen the chance of contact between the fly and man because certain immigrants from a neighbouring territory were found to be infected with sleeping sickness (*Trypanosoma rhodesiense*). The general position in this region is encouraging; in most infested areas the fly has continued to diminish, opening up of the country by settlement is increasing, and small livestock can be kept in reasonable safety. The results of the last three years' grass burning became increasingly obvious; there was a distinct thinning of *Acacia*, *Olea chrysophylla* attacked by burning at the base generally died, *Euphorbia candelabra* was steadily reduced, and thickets of *Grewia* and *Rhus* were adversely affected. The diminution in the numbers of fly is the more satisfactory as it occurred although game was protected until September and increased prospecting and mining activities resulted in additional motor traffic. It is reasonably certain that if measures against the fly had not been taken invasion of a large section of the uninfested areas would have occurred and the " fly belt " would have been double its present size. The smoke houses [*cf.* **17** 120; **20** 219] have operated satisfactorily and have undoubtedly helped to check the distribution of *G. morsitans* by means of the increased motor traffic. In Maruzi, south Lango, the delayed grass burning showed better results than in previous years, and steady progress in control is apparently being made.

In an appendix (pp. 29–45), J. Carmichael, Assistant Veterinary Pathologist, gives a list of 12 additional ticks (including two undescribed species) found in Uganda, showing their hosts [*cf.* **20** 219]. Attempts were made to transmit *Trypanosoma congolense* by means of Arthropods other than *Glossina* [*cf.* **22** 174]. Adults of *Rhipicephalus appendiculatus*, Neum., fed as nymphs on an infected animal did not cause infection. In Uganda, trypanosomiasis of cattle is often serious in districts where *Glossina* does not occur. Experiments were therefore carried out to determine whether *T. congolense* could be transmitted by *Tabanus thoracinus*, P. de B., which is ubiquitous, attacks persistently, and sucks blood voraciously, and with *Stomoxys*, among which *S. calcitrans*, L., predominated, although *S. nigra*, Macq., was also present. All efforts to keep the Tabanids alive for more than about two days were unsuccessful. When they were introduced into a fly-proof insectary containing cattle, at the rate of 50 a day for seven days, only one was seen to attack. However, satisfactory results were obtained when the flies, in ordinary fly boxes used for *Glossina*, were placed on an infected animal for 10 seconds and then removed to a healthy animal, the procedure being repeated until the flies were engorged. The same technique was used for *Stomoxys*, but these flies could be kept alive for 10 days provided that the boxes were not overcrowded. It was found that *T. thoracinus* could transmit *T. congolense* by interrupted feedings, even when 15 seconds elapsed before the second feed. Trypanosomes in the blood on its mouth-parts were killed by desiccation in about 30 seconds, so that it is unlikely that mechanical transmission can occur if the feed is interrupted for longer than this. Positive results were obtained after feeding as few as 35 Tabanids, and

there is evidence that transmission would be obtained with still fewer flies. Viable trypanosomes were observed in the gut of *T. thoracinus* 6 hours after feeding, but the fly could not be kept alive long enough to determine whether any cyclical development took place. In one experiment, *T. congolense* was successfully transmitted by interrupted feeding of *S. calcitrans*. Wild examples of *G. palpalis*, R.-D., fed on healthy cattle were found to transmit *T. vivax* readily and *T. brucei* much more rarely; cattle infected with *T. brucei* were not affected if kept stabled and fed well. On the other hand *T. brucei* isolated from animals that have been naturally infected by wild examples of *G. morsitans* has been found to be distinctly pathogenic for cattle as well as for sheep and goats.

STEWART (J. L.). [Report of the] **Veterinary Laboratory.**—*Rep. Dep. Anim. Hlth Gold Cst 1933–34* pp. 11–19. Accra, 1934.

Spirochaetosis of poultry was very prevalent in the Gold Coast during the year, the outbreaks occurring chiefly during the dry season. The vector [*Argas persicus*, Oken] was always found, although in small numbers only. The routine preventive measures are flaming the poultry houses with a blow-lamp and applying "flit" to birds harbouring ticks, which are usually found under the wings. Sheep were infested by *Psoroptes ovis*, Hering, which had not previously been recorded in the Gold Coast.

Rains were severe and flooding more extensive than usual, and, in spite of the clearing on the Naboggo River already described [*cf. R.A.E.*, B **21** 11, 245], tsetse-flies were found in the western part of the area at the height of the rains. Some further clearing was necessary as it was found that the river, which had been thought to flow due west, curved back to the neighbourhood of the cleared area. As *Mimosa asperata*, the seeds of which are water-borne, was found in thick clumps at the outer portion of every bend, efforts should be made to remove it before its seeding time in April. Clearing is started as soon as possible after the rains, all branches are cut into lengths of 2–3 yards and piled over the stumps, and the piles, which are left as long as possible to dry, are burned in April before the rains start. The trees not killed by burning are so weakened that flooding during the rains completes their destruction. Large timber trees giving high shade are left uncut, as neither *Glossina tachinoides*, Westw., or *G. palpalis*, R.-D., has been found to use this type of shade. Moreover, the trunks would form excellent breeding-places for fly if left on the ground. During 1934 in one part of the river, 138 flies were caught before clearing, 28 after clearing, and none after burning. Continuous catching carried out chiefly in the uncleared parts of the river both upstream and down between December 1933 and March 1934, yielded 2,657 examples of *G. tachinoides* and only 43 of *G. palpalis*, none of the latter being caught in March. The gradual increase in the numbers of flies during this period indicates repopulation of the river after they have been dispersed by the flooding. The uncleared part of the river above the clearing must be repopulated from reaches higher upstream where flooding is not so severe; for repopulation occurred more quickly than in the uncleared area below the clearing. These observations suggest that on the many tributary rivers similar to the Naboggo, it might be possible to eliminate fly by clearing the upper reaches to prevent breeding throughout the rains, and a considerable belt in the lower reaches to prevent repopulation

from the main river, leaving uncleared large reaches subject to annual flooding, where the fly would gradually die out for lack of repopulation.

Few examples of *G. tachinoides* were caught on fly screens (4 ft. by 2 ft.) carried slowly along at a height of 1½ ft. from the ground, but the results were more satisfactory when the screens were allowed to rest on the ground, the flies alighting on them being caught in a net by a native sitting alongside. No significant differences in the numbers of flies caught were obtained with screens coloured khaki, dark blue or grey ; but it is suggested that, in this case, the flies were attracted by the scent of the natives, for in experiments with single screen traps [*cf.* **21** 114], the trap with a dark-brown screen was more effective than those with dark blue, grey or striped screens. The number of pregnant females caught increased when screens were employed. The use of traps appears to be limited and is not considered a practical method of eliminating this fly. Examples of *G. tachinoides* were caught 3½–4 miles from their primary foci on the river, and no evidence of breeding was found in the intervening country.

Entomological Division.—*Rep. Dep. Hlth Palestine 1933*, pp. 97–98. Jerusalem, 1934.

No unusual Anophelines were identified during the year. Fleas from rats caught at the ports of Haifa and Jaffa comprised 1,355 *Xenopsylla cheopis*, Roths., 106 *Ceratophyllus fasciatus*, Bosc, 260 *Leptopsylla segnis*, Schönh., and 31 *Ctenocephalides* (*Ctenocephalus*). All four species were found on both *Mus* (*Rattus*) *rattus* and *M* (*R.*) *norvegicus*. A larva of *Ephestia cautella*, Wlk. (fig moth) was found in the stool of a young child.

Stuart (G.). **The Anopheline Mosquitos of Palestine.**—*J. Egypt. med. Ass.* **16** no. 7 pp. 769–776. Cairo, July 1933.

Notes are given on the morphology, breeding-places, seasonal prevalence and malaria transmitting capacity of the more important Anophelines that occur in Palestine [*cf. R.A.E.*, B **18** 188 ; **20** 3].

Shapiro (J. M.). **Rural Malaria Control in Palestine.**—*J. Egypt. med. Ass.* **16** no. 8 pp. 850–857. Cairo, August 1933.

An account is given of the rural breeding-places and seasonal prevalence of the Anophelines of Palestine, with a discussion of the control measures employed. In dealing with irrigation canals, clearing and straightening to give free flow are of great importance. The water may be drained from the canal for one or more days (in which case the canal usually dries before the water is run in again) ; in the case of canals running for long distances, the water may be dammed so that the lower portion dries, the water subsequently being released with force to bring about flushing ; or, where possible, short double canals may be made and used alternately, so that one may be allowed to dry. The clearing carried out to facilitate the application of larvicides may also effect a change in the Anopheline fauna, and a less efficient malaria vector such as *Anopheles superpictus*, Grassi, may be found together with *A. sacharovi*, Favr (*elutus*, Edw.) in a breeding-place that formerly harboured only the latter species.

Benarroch (E. I.). **Estudios relativos al paludismo en Venezuela. Observaciones acerca de los zancudos transmisores.** [Studies related to Malaria in Venezuela. Observations on the Mosquito Vectors.]—15 pp., 3 pls., 12 refs. Caracas, 1934.

The relation to malaria of *Anopheles darlingi*, Root [*R.A.E.*, B **20** 9] and *A. albimanus*, Wied., in Venezuela is discussed. The latter is common on the northern coast and does not occur much further south. It is found in houses more frequently than any other Anopheline except *A. darlingi* and feeds readily on man, 50 per cent. of females examined containing human blood. Of 189 Anophelines taken during outbreaks of malaria, 70 per cent. were *A. albimanus* and 2 of these contained oöcysts. *A. bachmanni*, Petrocchi, and *A. pseudopunctipennis*, Theo., were suspected of being vectors, though no proof was obtained.

[Kharitonov (D. E.).] **Харитонов (Д. Е.). Observations on the Biology of the Malaria Mosquito (*Anopheles maculipennis* Meig.) in the Manchazh Subdistrict of the Ural Province.** [*In Russian.*]—*Bull. Inst. rech. biol. Perm* **9** no. 6–8 pp. 297–309, 10 refs. Perm, 1934.

A detailed account is given of observations on the adults of *Anopheles maculipennis*, Mg., carried out in the spring and summer of 1925 in the south-west of the Ural Province. In most of this area there were apparently three generations in the year, the adult males occurring in mid-June, mid-July, and early August; but in one locality, where streams, etc., dried up by the middle of July, there were only two generations. Females with developed fat-bodies were first observed in the second half of July and became very abundant during August. Of the females found hibernating in April, 90 per cent. were in warm sheds for cattle, pigs and sheep; of the other types of shelters, basements of unheated buildings were preferred, and only a few mosquitos were taken in basements and rooms of inhabited houses. Some occurred in suitable quarters at a distance of nearly a mile from water and at a level of about 100 ft. above the ground. They chiefly congregated on ceilings and the upper parts of walls, especially in corners. They seldom assumed the typical Anopheline resting position, usually resting in the same way as *Culex* does. Badly built animal quarters with large cracks in the walls were avoided. Activity was resumed about mid-April, and active oviposition apparently occurs in the field in the first half of May. In the second half of April, females oviposited in the laboratory within $4\frac{1}{2}$–$8\frac{1}{2}$ days after a blood meal, and females taken in hibernation quarters at the end of the month and containing fresh blood did so in about 3 days. The number of eggs laid varied from 89 to 248. In the summer, most of the mosquitos occurred by day in warm sheds for domestic animals, and only a few in dwellings and outhouses.

Khaw (O. K.) & Kan (H. C.). **Some Observations on the Prevalence of Malaria in Nanking and its Vicinity.**—*Chin. med. J.* **48** no. 2 pp. 109–123, 2 figs., 28 refs. Peiping, February 1934.

In a survey conducted in districts near Nanking in 1932, 47 per cent. of nearly 7,000 persons examined had a malaria history and 6 per cent. showed parasites in their blood. *Plasmodium vivax* was the prevalent parasite, except in September, just after the heavy rains, when *P. falciparum* was predominant. The percentage of infection due to

P. malariae rose from 2 in September to 28 in November. The only Anopheline found was *Anopheles hyrcanus* var. *sinensis*, Wied. The larvae were present from the end of April to the end of November, when the temperature (47·5°F.) put an end to breeding. They preferred clear water, but were also found in muddy water stirred by cattle, although none was collected in pools where there was dead duckweed. The adults were observed to frequent pig-sties, stables and hen-coops. In 1,200 dissections 5 infected females were found. In experiments in November they could not be infected with *P. falciparum*, probably because the patient had had quinine, but 4 out of 18 fed on a case infected with *P. malariae* showed oöcysts.

The chief causes of the high incidence of malaria in Nanking are the insanitary housing conditions, the multiplication of breeding-places involved in vegetable and rice cultivation, and through the pits made during building and road making, and the vagrancy of infected casual labourers and discharged soldiers. Among the measures of control suggested are the use of larvicides where they can be afforded, the provision of piped water supplies, the introduction of *Gambusia* into wells and pools, and the prohibition of rice and vegetable cultivation within about 2 miles of residential quarters.

DE MELLO (F.). **Première campagne antimalarienne active à Gôa.**—*Arq. Esc. méd.-cirurg. Nova Goa* Ser. B no. 5 pp. 1025–1211. Nova Goa, 1934. [In French with Reports in Portuguese intercalated.]

In the Velhas Conquistas division of the Portuguese colony of Goa, malaria is very rare, but it is prevalent in the other part, Novas Conquistas, which differs in that it is mountainous and has extensive jungle areas, inadequate roads and a population with a very low standard of living. Severe malaria has spread to places formerly free from it, the population decreasing steadily in some districts. In certain localities, the spleen index was 100 per cent. Following an enquiry by a commission appointed in 1929, medical stations have been established, and quinine and plasmochin are administered extensively. All collections of water likely to breed Anophelines are drained or dusted with Paris green, and jungle and undergrowth on the banks of streams or within 1,100 yards of villages are cleared away. At the same time mosquitos in houses are destroyed by fumigation. The excellent results up to February 1933 encourage continuance of the work.

The Anophelines found were *Anopheles culicifacies*, Giles, *A. maculatus*, Theo., *A. hyrcanus* var. *sinensis*, Wied., *A. fluviatilis*, James (*listoni*, List.), *A. annularis*, Wulp (*fuliginosus*, Giles), *A. stephensi*, List., *A. leucosphyrus*, Dön., *A. pulcherrimus*, Theo., *A. sundaicus*, Rdnw. (*ludlowi*, auct.), *A. subpictus*, Grassi (*rossi*, Giles), *A. jamesi*, Theo., *A. vagus*, Dön., *A. barbirostris*, Wulp, *A. culiciformis*, Cogill, *A. karwari*, James, *A. aitkeni*, James, and *A. theobaldi*, Giles.

MESNARD (J.) & TOUMANOFF (C.). **Note préliminaire sur l'anthropophilie de *A. minimus* Theo. avec quelques remarques sur la zoophilie de *A. vagus* Dön. en absence de stabulation parfaite du bétail.**—*Bull. Soc. méd.-chir. Indochine* **11** no. 8 pp. 994–1000, 3 figs., 8 refs. Hanoi, 1933.

Precipitin tests, using anti-human, anti-buffalo and anti-horse sera, were carried out to determine the nature of the blood ingested by

Anopheles minimus, Theo., collected in a locality in Cochin China, where malaria is hyperendemic. In addition to human habitations, there were buffalo stables and poultry houses, and dogs were numerous. The results showed that 86·48 per cent. of the engorged mosquitos had fed on human blood ; no buffalo or horse blood and no mixed reactions were obtained. As 13·52 per cent. of the engorged mosquitos gave negative reactions, further tests will have to be made to ascertain whether they had fed on small animals, particularly dogs. A study of the maxillary index of *A. minimus* made at the same time showed that it was as low as in other parts of Indo-China [*cf. R.A.E.*, B **21** 140] and thus confirmed the conclusion that this mosquito feeds chiefly on man. The only Anophelines taken in the rainy season in a typical village of the delta, where malaria is practically unknown, were small numbers of *A. vagus*, Dön., and *A. hyrcanus* var. *sinensis*, Wied., and these could only be found in houses. In precipitin tests only buffalo blood was found, so that the mosquitos were evidently using the houses as resting places, probably because the buffalo shelters consisted merely of a thatched roof supported on posts.

TOUMANOFF (C.). **Sur la fréquentation des habitations et des étables par les anophèles du Tonkin et la proportion des sexes dans les captures et les élévages.**—*Bull. Soc. méd.-chir. Indochine* **11** no. 8 pp. 1001–1017, 9 refs. Hanoi, 1933.

Details are given of a study of the distribution of Anophelines in houses and stables (chiefly buffalo sheds) in the whole of Tonkin and in one locality throughout the year, and in the one locality in particular seasons, and of the proportion of sexes in each situation compared with the proportion of sexes in adults reared from larvae caught in nature and in adults reared from the egg. Taking the figures for the whole year for the whole of Tonkin and for the one locality, *Anopheles vagus*, Dön., predominated in houses, *A. minimus*, Theo., coming second and *A. hyrcanus* var. *sinensis*, Wied., third ; in stables *A. hyrcanus* var. *sinensis* was most numerous, *A. vagus* came next and *A. minimus* third. Taking figures for the winter monsoon season, the period of maximum prevalence of *A. minimus*, this species occupied the first place in houses, the second, third and fourth being taken by *A. vagus*, *A. aconitus*, Dön., and *A. jeyporiensis* [var. *candidiensis*, Koidz.], respectively. During the summer monsoon (rainy season) the order of prevalence in houses was *A. vagus*, *A. hyrcanus* var. *sinensis*, *A. aconitus*, *A. tessellatus* Theo. [*cf. R.A.E.*, B **21** 191] and *A. minimus*, Theo. In stables during these two periods *A. hyrcanus* var. *sinensis* predominated and *A. vagus* occupied the second place, *A. minimus* occupying the fourth and sixth places respectively. Although *A. minimus* predominated in houses at the time of its greatest abundance and *A. hyrcanus* var. *sinensis* was always the most prevalent species in stables, the habitat of the adult Anophelines was not related to their ability to transmit malaria, and known vectors such as *A. jeyporiensis* var. *candidiensis* and *A. aconitus* [*cf.* **22** 90] were found in both stables and houses.

Females predominated in both houses and stables but the scarcity of males was only apparent, the proportion of the sexes among adults reared from larvae caught in nature or from eggs laid in the laboratory being almost equal, although females were slightly more numerous.

Boumeester (J. E.). **Malariabestrijding te** [Malaria control at] **Dabo (Singkep).**—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 19 pp. 1209–1218, 11 refs. Batavia, 11th September 1934. (With a Summary in English.)

This work was done at a coastal town in the island of Singkep, Rhio Archipelago, where there was severe endemic malaria. The Anophelines found were *Anopheles sundaicus*, Rdnw., *A. umbrosus*, Theo., *A. hyrcanus*, Pall., *A. hyrcanus* var. *sinensis*, Wied., *A. maculatus*, Theo., *A. separatus*, Leic., *A. karwari*, James, and *A. kochi*, Dön.

Of these the last three did not appear to be involved in transmission. *A. maculatus* was very rare, and no adults were taken, but it is a probable vector inland. *A. sundaicus*, which bred in pools of brackish water, represented 95 per cent. of the Anophelines in houses, and in November 1932 oiling against it was begun. During the first half of 1933 all its breeding-places were drained or filled up, with the exception of a basin cut off from the sea, on which weekly oiling was continued. As a result, the town was practically freed from *A. sundaicus* and there was a considerable improvement in the malaria position. As an experiment, the weekly oiling of the basin was stopped once, and larvae of *A. sundaicus* immediately re-appeared in the water, which contained 0·3 per cent. NaCl. *A. karwari* was taken in the houses of Europeans on a hill, but the 27 specimens dissected were not infected. *A. hyrcanus* var. *sinensis* was taken in numbers in the open, but was rare in houses. Of 281 females dissected, as well as 7 of *A. umbrosus*, none was infected.

Walandouw (E. K.). **Nematoden als bestrijders van** *Anopheles* **larven.** [Nematodes as Enemies of *Anopheles* Larvae.]—*Geneesk. Tijdschr. Ned.-Ind.* **74** no. 19 pp. 1219–1224, 2 pls., 7 refs. Batavia, 11th September 1934. (With a Summary in English.)

A preliminary description is given of a Nematode found parasitising larvae of a variety of *Anopheles leucosphyrus*, Dön., in Sumatra. It occurs as a freely moving larva or adult in the body-cavity of the Anopheline larva, and causes the death of the host by boring its way out through the body wall.

Laurel (A. G.). **Feeding Activities of some Philippine** *Anopheles*.—*Rev. filipina Med.* **25** no. 7 pp. 286–297, 34 refs. Manila, July 1934.

Philippine Anophelines have never been observed to bite during the day under natural conditions. They become active at nightfall, and it is believed that they are guided to their hosts by a sense of smell. If hosts are available, they tend to feed at once and, if undisturbed, generally engorge in about 3 minutes. After a blood meal they probably rest on walls, posts, or blades of grass for a few hours, returning to their daytime resting places [*R.A.E.*, B **20** 59; **21** 50] at daybreak. From April to November 1932 about 7,400 examples of *Anopheles minimus* [var. *flavirostris*, Ludl.], and 3,500 of *A. maculatus*, Theo., were caught during the day, and 66·7 and 55·1 per cent. respectively were engorged. During 34 months' observations, 74·47 per cent. of the Anophelines caught in traps with human bait were *A. minimus*, whereas this species constituted only 3·4 per cent. of those caught round animals; the actual numbers caught in the latter case were, however, greater.

Although a few mosquitos containing animal blood were caught in traps and some contained mixed human and animal blood, it would appear that in general those caught in the traps had fed on man and those near animals on animals. Precipitin tests showed that out of 1,433 examples of *A. minimus*, 94 had fed on man, 920 on cow or carabao, and 4 on both man and cow or carabao; the rest gave negative reactions to human and bovine antisera. The weight of a blood meal is a little over 1 mg. In one locality the percentage of *A. minimus* containing human blood was 6·7 and the percentage of malaria infection 0·09, in another the percentages were 10·9 and 0·27 respectively.

A. maculatus, Theo., which is also a vector of malaria, enters houses and in one locality constituted 30 per cent. of the Anophelines trapped in mosquito nets in them. Of 249 showing positive reactions in the precipitin tests, 7 contained human blood. The weight of a blood meal is about 2 mg.

All examples of *A. ludlowi*, Theo., that were positive in the precipitin tests reacted to bovine blood, but during April–May 1932 the author caught 266 examples of *A. litoralis*, King [*cf.* **20** 92] in a house, and of 13 tested all contained human blood. This mosquito bites in bright electric light, but seems to prefer to feed in dark corners in the shade under beds and tables, so that the legs are frequently attacked. The average weight of the blood meal is 2·1 mg.

Other Anophelines that reacted in small numbers to human antiserum were *A. vagus*, Dön., *A. karwari*, James, *A. tessellatus*, Theo., *A. kochi*, Dön., *A. filipinae*, Mnlg., *A. barbirostris*, Wulp, and *A. hyrcanus* var. *nigerrimus*, Giles.

[De Meillon (B.). Report of the] **Department of Entomology.**—*Rep. S. Afr. Inst. med. Res. 1933* pp. 35–37, 3 refs. Johannesburg, 1934.

Further work at Tzaneen, Transvaal, has confirmed previous observations as to the rarity of *Anopheles funestus*, Giles, in houses at altitudes over 2,500 ft. [*cf. R.A.E.*, B **22** 53]. Adults were collected in huts at 2,500 ft., 500 ft. above and a mile distant from breeding-places; thus the absence of larvae from a locality does not necessarily indicate that malaria will not be contracted. Determinations of gravid females by means of their eggs [*cf.* **22** 211] verified the suggestion that *A. funestus* subsp. *leesoni*, Evans, does not frequent habitations [**21** 133]. Almost all females taken out of doors belong to this subspecies.

Of more than 900 fleas received for identification from plague areas in South-West Africa, 93 per cent. were *Xenopsylla eridos*, Roths., and the rest *X. brasiliensis*, Baker, and *Echidnophaga gallinacea*, Westw. [*cf.* **21** 30].

Weyer (F.). **Ueber die Anophelen Mecklenburgs, insbesondere die Verbreitung der Rassen von** *Anopheles maculipennis*. [On the *Anopheles* of Mecklenburg and especially on the Distribution of the Races of *A. maculipennis*.]—*S. B. naturf. Ges. Rostock* (3) **4** (1933) pp. 59–75, 3 figs. Rostock, 7th June 1934. [Recd. October 1934.]

Both *Anopheles maculipennis*, Mg., and *A. claviger*, Mg. (*bifurcatus*, auct.) were found in Mecklenburg in 1933, often together. In a

marshy district, several adults of *A. algeriensis*, Theo., were taken in a stable [*cf. R.A.E.*, B **20** 3]. *A. plumbeus*, Steph. (*nigripes*, Staeg.) was found in three localities.

Studies on the distribution in Mecklenburg of the races of *A. maculipennis* showed that *atroparvus*, van Thiel, predominates on the coast (though there is no malaria), and *messeae*, Flni., in the inland lake region. The typical *maculipennis* is rare and usually occurs where *atroparvus* and *messeae* are mixed. Though as a general rule *atroparvus* represented a brackish water race, it sometimes occurred in breeding-places typical of *messeae*. Moreover, numerous eggs of the latter were found on brackish water. Inside dwellings, it was not possible to distinguish preferred haunts of the different races. Though malaria no longer occurs in Germany in districts with a pure population of *messeae*, it has not been proved that *messeae* is markedly zoophilous. In one locality of Mecklenburg, 6 females of this race captured in bedrooms contained human blood. It is evident, therefore, that an exact ecological and physiological differentiation of the two races is impossible.

Boyd (M. F.) & Stratman-Thomas (W. K.). **Studies on Benign Tertian Malaria. 7. Some Observations on Inoculation and Onset.** —*Amer. J. Hyg.* **20** no. 2 pp. 488–495, 2 refs. Baltimore, Md, September 1934.

The experiments described were undertaken to determine whether sporozoites of *Plasmodium vivax* can be successfully inoculated by the female Anopheline either when the lumen of a blood vessel is penetrated immediately by the proboscis or in the course of one or more exploratory insertions made to locate such a vessel. It was found that sporozoites, in numbers sufficient to cause infection, are discharged into the circulation by the feeding mosquito, and that when they are discharged into the subcutaneous tissues during penetration by the proboscis, they are capable of making their way into the circulation. Attempts to induce sporozoites to invade erythrocytes were unsuccessful.

Russell (P. F.) & Santiago (D.). **Flight Range of Anopheles in the Philippines. Second Experiment with Stained Mosquitos.**—*Amer. J. trop. Med.* **14** no. 5 pp. 407–424, 4 figs., 1 map, 2 refs. Baltimore, Md, September 1934.

A second experiment on the flight range of Philippine Anophelines [*cf. R.A.E.*, B **22** 105] was undertaken in January and February 1934 during the north-east monsoon, when the winds were considerably stronger. Larvae caught in streams were placed in a cage built so that a small portion of a stream flowed through it, and larger numbers of adults were obtained in this way than when pans were used for rearing. A 2 per cent. aqueous solution of brilliant blue was again used for staining, but it was applied by means of pressure paint sprayers, which were found to give a finer, more evenly distributed spray than small atomisers. The solvent used for detecting the stain consisted of equal parts of glycerine, methyl alcohol and chloroform, and the dye could be detected on mosquitos two weeks after application. A total of 10,000 stained mosquitos were liberated and catches were made in 15 earth-lined traps [*cf.* **22** 65] and about 100 natural day-time resting-places within a radius of 2½ miles from the point of release. Among

the 31,011 mosquitos caught were 11 stained examples captured at the following distances : 5 females of *Anopheles minimus* var. *flavirostris*, Ludl., 218–2,406 yds. S., 2 males 328 and 2187 yds. S. and 1 female 218–438 yds. N. ; 1 male of *A. mangyanus*, Banks, 328 yds. S. ; 1 male of *A. barbirostris*, Wulp, 437–656 yds. S. ; and 1 male of *A. subpictus* var. *indefinitus*, Ludl., 2,187 yds. W. It is concluded that Anophelines tend to fly with the wind and that the north-east monsoon may have a pronounced effect in extending the flight range of malaria vectors in the Philippines.

Hill (R. B.). **Feeding Habits of some Venezuelan** *Anopheles*.—*Amer. J. trop. Med.* **14** no. 5 pp. 425–429, 3 refs. Baltimore, Md, September 1934.

Mosquitos captured in three localities within 2½ miles of Maracay in the Lake Valencia region of Venezuela, were subjected to precipitin tests to determine the source of their blood meals. All examples of *Anopheles albimanus*, Wied., were taken in one locality, chiefly from beneath a table in a room where two dogs were habitually present ; 34 per cent. of this species reacted to human anti-serum, 34 to dog anti-serum, only a few to horse, cow, fowl or pig anti-sera, and the rest proved negative. *A. bachmanni*, Petrocchi, and *A. tarsimaculatus*, Goeldi, definitely preferred animal blood ; out of 262 of the former 14 reacted to human anti-serum, 173 to horse, 31 to cow and 37 were negative, and out of 114 of the latter 3 reacted to human anti-serum, 84 to horse, 21 to cow and 6 were negative. Dog, fowl and pig anti-sera were not tested with these Anophelines. *A. tarsimaculatus* would appear to be definitely less dangerous as a malaria vector than *A. bachmanni* [*cf. R.A.E.*, B **20** 10]. In the case of *A. pseudopunctipennis*, Theo., an important vector in Argentina [*cf.* **20** 71], only 1 out of 40 examples showed human blood, and as this species is prevalent at the time when malaria incidence is lowest, it is doubtful whether it is a vector in this part of Venezuela. The numbers of the other species tested are too small to permit conclusions, though it was ascertained that *A. neomaculipalpus*, Curry, and *A. apicimacula*, D. & K., which have never been associated with malaria, do occasionally feed on man.

Kemp (H. A.), Moursund (W. H.) & Wright (H. E.). **Relapsing Fever in Texas. IV.** *Ornithodorus turicata* **Dugès : a Vector of the Disease.**—*Amer. J. trop. Med.* **14** no. 5 pp. 479–487, 10 refs. Baltimore, Md, September 1934.

The observations recorded on the bionomics of *Ornithodorus turicata*, Dugès, a vector of relapsing fever in Texas [*R.A.E.*, B **22** 106, etc.], were practically all made on ticks kept in pill-boxes and may not therefore represent exactly their behaviour in nature. The number of eggs laid by single females varied from 25–123 with an average of 40–50, and the act of oviposition appeared to be complete within a few hours. As the ticks became older, the number of eggs in a single oviposition diminished remarkably. As many as four ovipositions were observed in adults caught in nature, but these ticks may have oviposited previously. In most cases oviposition took place within 3–5 days of feeding, and the eggs hatched in 2–4 weeks according to temperature and

moisture conditions, higher temperatures with a slight amount of moisture apparently hastening incubation. When kept too moist, the eggs became covered with moulds and development ceased. Larvae kept in moist pill-boxes at temperatures varying from 23 to 16°C. [73·4 to 60·8°F.] moulted after 12 days, and usually became second-stage nymphs within a further 12 days. As many as 5 nymphal instars were observed. It seems possible that the adults live two years or possibly more ; they have been kept alive in pill-boxes for 5 months without a blood meal. Larvae engorged within 10–30 minutes and then left the host ; most of the nymphs detached themselves shortly after engorging, though some remained attached for several hours ; most adults remained attached for hours and although some left the host after 60–90 minutes, others remained for two days. Ordinarily adults will feed every 3–4 weeks if hosts are available, and nymphs directly after each moult.

The presence of spirochaetes was not clearly demonstrated in the coxal fluid of ticks known to be infected, and no infection or immunity developed in rats inoculated intraperitoneally with a saline suspension of this fluid. Infection was produced by the bites of infected ticks removed before the coxal fluid was excreted and by the bites of ticks in which the excretory orifices had been sealed with collodion. In every instance infection developed as quickly as in cases where the coxal fluid had been allowed to soil the wound. Three experiments in which eggs from infected ticks were emulsified in saline and inoculated intraperitoneally into rats gave negative results [*cf.* **21** 244]. Sections of ticks made 2–15 days after they had fed on a rat heavily infected with the " Falls County " strain of the Texas spirochaete revealed large numbers of spirochaetes in the muscular and connective tissue structures of practically every organ in the body. Once infected, *O. turicata* apparently remains so for the rest of its life. The rate of infection in ticks in nature varies considerably, no infective ticks being found among more than 130 examples collected from two caves where cases of relapsing fever were known to have been contracted. The authors were unable to transmit *Spirochaeta recurrentis* (*Borrelia obermeieri*) from rat to rat or from rat to monkey (*Macacus rhesus*) by means of *O. turicata*, nor in two other experiments to transmit a laboratory strain of *S.* (*B.*) *novyi* from rat to rat [*cf.* **22** 106].

SACHS (A.). **Relapsing Fever in Chitral.**—*J. R. Army med. Cps* **63** no. 4 pp. 217–230, 1 map, 7 refs. London, October 1934.

For several years an increasing number of cases of relapsing fever have been reported among the troops stationed in Chitral. The disease has been chiefly confined to Indian troops and is more prevalent among men using the Hindustan-Chitral Road and those moving about within the State, than among those stationed at the two forts. The spirochaete observed morphologically resembles *Spirochaeta recurrentis* ; clinically both the louse-borne and tick-borne types of fever occur. No cases of fever have occurred among the large numbers of troops that use the road, but camp in the open instead of using the levy posts. Investigations on blood-sucking Arthropods were therefore undertaken at the levy posts. Although there was little evidence of infestation by lice among the levies, almost all the coolies were infested, chiefly with *Pediculus humanus*, L., but as many of the infected men were definitely

stated to be free from lice, it would appear that the louse cannot be the only vector. The ticks, *Argas persicus*, Oken, and *Ixodes ricinus*, L. (*reduvius*, L.), were taken at one of the posts, and two nymphs of *Hyalomma aegyptium*, L., were found on man. *Cimex lectularius*, L., was obtained from all posts but one. Six out of 16 men who halted for the night at the post where the ticks were found contracted the disease, whereas no cases occurred among the men who proceeded directly to camp without halting there. The results of transmission experiments were inconclusive. The period January–March is the most favourable for the breeding of lice, but the number of cases at that time is less than at any other. The cases in Chitral State occurred chiefly during the hot weather, a seasonal incidence that would suggest the tick-borne type of fever.

ROZEBOOM (L. E.). **The Effect of Bacteria on the Hatching of Mosquito Eggs.**—*Amer. J. Hyg.* **20** no. 2 pp. 496–501, 9 refs. Baltimore, Md, September 1934.

The author considers that the conflicting opinions as to the part played by bacteria in the hatching of the eggs of *Aëdes aegypti*, L. [*R.A.E.*, B **5** 74, 155 ; **15** 93 ; **16** 120] may possibly be reconciled on the basis of the age and degree of drying of the eggs used. Of old, dry eggs, only 4 hatched in sterile media, whereas 204 hatched within the two days following contamination. Of fresh, moist eggs, 35 per cent. hatched in distilled water, 51 per cent. in sterile, filtered breeding water and 82 per cent. in water contaminated with bacteria. Five eggs remained dormant in a flask of sterile filtrate for 30 days, but hatched on the day following the addition of bacteria. The first or second batch of eggs from a given set of females appeared to hatch more readily than subsequent ones from the same females, thus supporting the findings of Roubaud that older females tend to deposit " inactive eggs " [**18** 36]. The eggs of three species of *Culex* hatched as readily in sterile as in contaminated media.

SILER (J. F.). **Report of the Health Department of the Panama Canal for the Calendar Year 1933.**—Med. 8vo, 84 pp. Balboa Heights, C.Z., 1934.

Malaria was unusually prevalent in the Panama Canal Zone in 1933. The rains, which usually cease about the end of November, continued in 1932 until the end of December, and breeding-places of *Anopheles albimanus*, Wied., in uncontrolled areas were abundant until January 1933, when flights into the controlled areas were still occurring. Breeding-places created in the course of works connected with the disposal of silt from the Canal are discussed in detail. It was necessary to dust one area by aeroplane with Paris green ; a 5 per cent. mixture of Paris green with pulverised clay was sufficient to destroy most of the Anophelines. *A. tarsimaculatus*, Goeldi, was found breeding for the first time on the Pacific side of the Canal Zone in a lake of brackish water impounded by a dyke ; adults of this species were taken at a distance of 2 miles from the breeding-place. No aeroplanes were used to dust the swamps at Old Panama during the rainy season of 1933 [*cf. R.A.E.*, B **21** 64]. The straightening of the channel of the Rio Matias Hernandez has improved the drainage of the west part, and as cattle were not pastured in this area to the usual extent, the swamp

vegetation has grown up and produced shade. Breeding occurred in small patches only and was controlled by the application of a 1 per cent. mixture of Paris green from hand dusters. The unusually large numbers of Anophelines that invaded the controlled areas at the end of the dry season (May and June) apparently originated in the region of Gatun Lake [*cf.* **22** 72]. The water level of the Lake having fallen about 8 inches lower than usual during the dry season, the areas of matted, decaying *Chara*, which afford ideal food and shelter for Anopheline larvae [*cf.* **21** 64], were more extensive than usual, and breeding during April-June was prolific. The Anophelines originating in this area and in those affected by the dredging projects already mentioned had abundant opportunities to become infected by attacking the chronic malaria carriers working on night shifts during the overhauling of the locks on the Pacific side of the Canal between January and June 1933. An unusually large number of the cases of malaria in ships anchored at Balboa at the end of May and the beginning of June were undoubtedly contracted on board. As a result of the improvement and extension of highways, an increasing amount of malaria is contracted by persons visiting uncontrolled areas of the Republic of Panama that were previously difficult of access.

Knowlton (G. F.) & Rowe (J. A.). **Preliminary Studies of Insect Transmission of Equine Encephalomyelitis.**—*Proc. Utah Acad. Sci.* **11** pp. 267–270, 17 refs. Provo, Utah, 1934.

In view of the possibility that equine encephalomyelitis is transmitted by blood-sucking insects [*cf. R.A.E.*, B **21** 155; **22** 225], a survey was begun in September 1933 to determine the insects of this type that occurred in infected parts of Utah. Emulsions of *Simulium vittatum*, Zett., collected while feeding in the ears of infected horses were injected into guineapigs, and examples of *Aëdes dorsalis*, Mg., collected and fed on infected horses were either placed in a cage with guineapigs that had been shaved closely enough to allow them to feed readily, or were emulsified and injected into guineapigs, but no definite conclusions regarding the spread of the disease by insects in Utah were obtained.

Antunes (P. C. de A.) & Lane (J.). **Notes on some Species of** *Aëdes* (*Ochlerotatus*) **(Diptera, Culicidae).**—*Rev. Biol. Hyg.* **5** no. 1 pp. 35–40, 4 pls., 15 refs. São Paulo, July 1934.

Notes are given in this paper on the morphology of *Aëdes crinifer*, Theo., *A. nubilus*, Theo., and *A. serratus*, Theo., from Brazil.

Peus (F.). **Die Dixiden- und Culiciden-Fauna des Odergebietes bei Bellinchen.** [Dixids and Culicids of the Oder District at Bellinchen.]—*Märk. Tierw.* **1** no. 1 pp. 35–40. Berlin, 1st October 1934.

The Culicids found in this district of Brandenburg include *Aëdes geniculatus*, Ol., which breeds in tree-holes, *Anopheles maculipennis*, Mg., and *Mansonia richiardii*, Fic. Artificial collections of water contained *Culex pipiens*, L., and *Theobaldia annulata*, Schr., while in areas subject to flooding *Aëdes caspius*, Pall., *A. annulipes*, Mg., *A. excrucians*, Wlk., *A. flavescens*, Müll., *A. sticticus*, Mg., and *A. vexans*, Mg., were abundant, *A. maculatus*, Mg., and *A. cinereus*, Mg., being less numerous.

ROUBAUD (E.). **Au sujet des différenciations raciales chez le moustique commun** *Culex pipiens* **L.**—*Ann. Parasit. hum. comp.* **12** no. 5 pp. 337–339, 2 refs. Paris, 1st September 1934.

ROUBAUD (E.) & MEZGER (J.). **La nourriture larvaire n'influe pas sur le développement de l'autogénèse, chez les races de** *Culex pipiens* **spécifiquement anautogènes.**—*T.c.* pp. 340–343, 1 ref.

In the first paper, the author expresses the opinion that the conclusions reached by P. de Boissezon on the question of the races of *Culex pipiens*, L. [*cf. R.A.E.*, B **22** 127] are erroneous, since he had not taken sufficient precautions to ensure that he was experimenting with the rural non-autogenous race, and was therefore in all probability using the autogenous race. In experiments described in the second paper, in which examples of the non-autogenous races, *C. pipiens pipiens* and *C. pipiens berbericus*, Roub., and the autogenous race, *C. pipiens autogenicus*, Roub. [*cf.* **21** 267] were all fed in the larval stage on cooked dried lentils as suggested by de Boissezon [**22** 2], and left without nourishment in the adult stage, eggs were only obtained from females of the autogenous race ; those of the other two races died without ovipositing and showed no sign of egg development on subsequent dissection.

WEYER (F.). **Versuche zur Eiablage ohne vorherige Blutnahrung bei** *Culex pipiens* **L.** [Investigations on Oviposition without previous Blood Meal in *C. pipiens*.]—*Verh. dtsch. zool. Ges.* **36** pp. 146–152, 5 refs. Leipzig, August 1934.

Females of a strain of *Culex pipiens*, L., from a cellar on the outskirts of Hamburg oviposited when fed only on sugar-water or even when entirely unfed. The reserve substances required for egg-maturation must, therefore, have been derived from the larvae [*cf. R.A.E.*, B **22** 127]. The eggs developed, and successive generations were reared without blood meals. The number of eggs in egg-rafts laid without a previous blood meal was about half the normal number [*cf.* **22** 61]. As representatives of the heterodynamic race [*cf.* **21** 267], hibernating females with pronounced fat-bodies were collected in February 1934 from a cellar in a rural district near Hamburg, and brought out of hibernation in a warm room. Those kept without food soon died without ovipositing, and those fed on sugar-water lived and accumulated further fat, but did not mature any eggs, whereas those fed on avian blood laid normal eggs. Similar results were obtained with females taken from a rural cellar in March, after hibernation was over. A certain percentage of the larvae of this strain, however, when reared with abundant food, gave rise to females that oviposited without a blood meal. It is not clear whether this was due to the presence of individuals of an autogenous race or whether larval feeding was the determining factor. Females from larvae that had fed in the last instar on dried blood did not oviposit. No difference was found due to larval feeding on cooked lentils [*cf.* **22** 127] or on hay infusion.

When females from batches that had produced no eggs were given the opportunity of sucking blood, practically none did so. Dissections showed that they were unfertilised. In the batches among which some females had oviposited, practically all had been fertilised and sucked

blood readily. In some batches in which pairing had not been successful, the introduction of males from other batches led to supplementary pairing and subsequent greater readiness for blood meals. Evidently pairing is a prerequisite for a blood meal in most females and for deposition of fertile eggs in all. Infertile eggs are rarely laid. In unfertilised females, egg-maturation continues until almost complete and then stops.

WEYER (F.). **Der Einfluss der Larvalernährung auf die Fortpflanzungsphysiologie verschiedener Stechmücken.** [The Influence of Larval Nutrition on the Physiology of Reproduction in various Mosquitos.] —*Arch. Schiffs- u. Tropenhyg.* **38** no. 9 pp. 394–398, 5 refs. Leipzig, September 1934.

Larvae of *Culex pipiens*, L., fed on powdered calf-liver developed more rapidly than on dried blood [*cf.* preceding abstract], and the resulting females sucked blood at least as readily as those from larvae reared on hay infusion. In autogenous batches, egg-maturation was more rapid and intensive after the animal diet. When, however, successive generations of larvae were fed on liver, an abnormally high mortality ultimately resulted, but immediately ceased when the larvae were fed on hay infusion. Larvae of *C. fatigans*, Wied., fed on blood with a little liver (though not on liver alone) produced normally mating males and females, but autogenous egg development did not occur. With *Aëdes* (*Stegomyia*) *aegypti*, L. (*fasciatus*, F.) a larval diet of blood and liver produced vigorous males and females, and two of the latter apparently laid autogenous eggs.

Larvae of *Anopheles maculipennis* var. *messeae*, Flni., or var. *atroparvus*, van Thiel, fed on either blood or liver, produced abnormally large adults, the larval mortality of the former being higher [*cf.* *R.A.E.*, B **22** 157]. An attempt to cause the males of *messeae*, which are eurygamic, to mate in captivity by feeding the larvae on liver was unsuccessful. The females of *messeae* matured their eggs normally after a blood meal, and one deposition of unfertilised eggs was observed.

HOSKINS (M.). **An Attempt to transmit Yellow Fever Virus by Dog Fleas** (*Ctenocephalides canis* **Curt.) and Flies** (*Stomoxys calcitrans* **Linn.).**—*J. Parasit.* **20** no. 5 pp. 299–303, 8 refs. Baltimore, Md, September 1934.

In these experiments, details of which are given in tables, batches of *Ctenocephalides canis*, Curt., and *Stomoxys calcitrans*, L., were starved for approximately 24 hours, allowed to feed for two minutes on monkeys (*Macacus rhesus*) infected with the Asibi strain of yellow fever virus, and then transferred to healthy monkeys to complete their feed. Some of the insects, after feeding on an infected and a healthy monkey, were ground in 10 per cent. normal serum and the mixture injected intraperitoneally into a healthy monkey.

The virus was not transmitted by fleas in the interrupted feeding experiments, but a monkey became infected after it had been injected with fleas fed 7 hours previously. The virus was not demonstrable in the bodies of fleas 18 hours after an infective feed. On the other hand, the virus was transmitted by the bites of *S. calcitrans* 6 (but not 16) hours after the infecting feed. Injections of flies gave positive results after 42 hours but not after 48.

Wilson (F. H.). **The Life-cycle and Bionomics of** *Lipeurus heterographus* **Nitzsch.**—*J. Parasit.* **20** no. 5 pp. 304–311, 2 figs., 2 refs. Baltimore, Md, September 1934.

Investigations on the bionomics of *Lipeurus heterographus*, Nitzsch, were carried out in the United States during 1930. When it was reared in an incubator at 33–34°C. [91·4–93·2°F.] with white feathers from a fowl as the only food, the egg stage lasted 5–6 days and the three nymphal instars 6–14, 8–14 and 11–14 days, respectively. Adults reared in captivity paired and laid fertile eggs. Pairing, moulting and feeding are described. Adults and nymphs kept under the same conditions but fed on the feathers of the little green heron (*Butorides virescens*) died after a short time. Although the results of these experiments are not conclusive, they indicate that death was due to improper nutrition, and may help to explain why, in spite of many opportunities for migration, lice do not become established on abnormal hosts. Feeding experiments using dried blood alone and dried blood and feathers showed that feathers constitute the essential food but are supplemented with blood when this is available. The author failed to rear *Menopon gallinae*, L., or *Eomenacanthus* (*Menopon*) *stramineus*, Nitzsch, or to induce them to oviposit under conditions in which *L. heterographus* throve, so that the food requirements of these species are apparently different [*cf. R.A.E.*, B **21** 189; **22** 121].

Buchmann (W.). **Medizinische Entomologie.**—*Reichs-Gesundheitsbl.* **9** no. 12 pp. 253–255. Berlin, 21st March 1934.

The scope of medical and veterinary entomology is discussed, the insects concerned being classified as parasitic, poisonous or vectors of disease. The third category may possibly include all species that come into close contact with warm-blooded animals liable to infectious diseases. Instances are given of biological and physiological problems that require investigation, notably those concerning the nutrition of blood-sucking insects, and the importance of popularising the facts already known is emphasised.

Buckley (J. J. C.). **A Note on the Development of** *Filaria ozzardi* **in** *Culicoides furens* **Poey.**—*J. Helminth.* **11** no. 4 pp. 257–258, 1 pl., 6 refs. London, October 1933.

Buckley (J. J. C.). **On the Development in** *Culicoides furens* **Poey, of** *Filaria* (=*Mansonella*) *ozzardi* **Manson, 1897.**—*Op. cit.* **12** no. 2 pp. 99–118, 8 pls., 20 figs., 12 refs. March 1934.

The history of investigations on *Filaria ozzardi* is reviewed. Experiments by various workers on its development in blood-sucking insects have given negative results, except that partial development has been observed in certain mosquitos [*cf. R.A.E.*, B **16** 207]. In no case, however, was the head invaded by the larvae. The author recently found 37·7 per cent. of inhabitants examined in Calliaqua, St. Vincent, infected with *F. ozzardi*, and observed complete development of the filarial larvae in examples of *Culicoides furens*, Poey, collected there in June and July 1933. Larvae identical with those obtained experimentally were found in 5 per cent. of the midges caught in nature, and the abundance of the latter in conjunction with the high infection rate in man seems to indicate that they are responsible for transmission.

In the second paper the development of the filarial larvae is described in greater detail. Of 200 examples of *C. furens* fed on carriers of the microfilariae, 27·5 per cent. were subsequently found to be infested with developing stages. The ingested microfilariae migrated within 24 hours to the thorax, where the entire morphological development took place. In midges kept alive for 7–8 days, advanced stages were found in the thorax and head, and emergence from the proboscis was obtained by slight pressure on the head with a needle. The first larval instar developed into the second during the first 3–4 days and to the third, infective, stage on the 5th or 6th day.

It is suggested that *C. paraensis*, Goeldi, which also occurs in Calliaqua may also be a vector.

Dimick (R. E.) & Mote (D. C.). **A Preliminary Survey of the Food of Oregon Trout.**—*Sta. Bull. Ore. agric. Exp. Sta.* no. 323, 23 pp., 15 figs. Corvallis, Ore., May 1934.

Examination of the stomach contents of a number of trout of the species most common in the streams and lakes of Oregon showed that insects form the greater part of their diet. Chironomids and Simuliids of all stages were frequently devoured, and larvae of mosquitos and Tabanids less often.

Hall (M. C.), Price (E. W.) & Wright (W. H.). **Parasites and Parasitic Diseases of Dogs.**—*Dep. Circ. U.S. Dep. Agric.* no. 338 (revd) 34 pp., 33 figs. Washington, D.C., June 1934.

This enlarged and revised edition of a previous circular [*R.A.E.*, B **13** 133] on the principal parasites and parasitic diseases of dogs in the United States and measures for their control, also contains information on those attacking cats. In addition to the mites, ticks, lice and fleas already noticed [*loc. cit.*], the parasites include *Linguatula serrata*, Froehl., the adults of which infest the nostrils of dogs. The eggs are expelled by sneezing or excretion and hatch if ingested by a suitable herbivorous animal, in which the larvae usually make their way to the liver, lungs or lymph glands. In the southern United States they are of fairly common occurrence in cattle. Reference is also made to the part played by fleas and lice as hosts of the larvae of the dog tapeworm, *Dipylidium caninum*, and to the occurrence of canine piroplasmosis in the United States, where the principal vector is probably *Rhipicephalus sanguineus*, Latr.

Fuller (M. E.). **Sheep Blowfly Investigations.—Some Field Tests of Baits treated with Sodium Sulphide.**—*J. Coun. sci. industr. Res. Aust.* **7** no. 3 pp. 147–149. Melbourne, August 1934.

Of 20 traps, each containing 4 pints water and a rabbit as bait, distributed over an area of 570 acres in Western Australia, those in which the bait was treated with 40 gm. crude crystalline sodium sulphide caught far more flies than the controls [*cf. R.A.E.*, B **20** 188]. *Calliphora* spp., which are responsible for much of the infestation of sheep in early spring, were captured in large numbers. These tests make the addition of sodium sulphide to baits in blow-fly traps worth practical consideration, especially as the treated baits remained attractive longer than the untreated baits in warm weather. Such small numbers of *Lucilia cuprina*, Wied., were caught that no conclusions could be drawn regarding it.

Fuller (M. E.). **Observations on the Flies responsible for striking Sheep in Western Australia.**—*J. Coun. sci. industr. Res. Aust.* **7** no. 3 pp. 150–152, 1 fig. Melbourne, August 1934.

During investigations made from August to November 1933 a little south of the Murchison district, it was found that infestation of sheep during September was due chiefly to *Calliphora australis*, Boisd., and *C. nociva*, Hardy [*cf. R.A.E.*, B **21** 56], and in November entirely to *Lucilia cuprina*, Wied. *Chrysomyia rufifacies*, Macq., was responsible for 7 per cent. of the infestation. Most of the sheep infested under observation were Merino ewe lambs ; those that were most wrinkled in the crutch were most susceptible, and ewe lambs were more frequently infested before than after shearing. Larvae collected from struck sheep in the Murchison district were mainly *L. cuprina* ; *Calliphora nociva*, but not *C. australis*, was also recorded from this locality. In the more southern parts of the State *C. australis* is mainly responsible for strike [*R.A.E.*, B **19** 113]. In the Murchison district *L. cuprina* is relatively scarce during the rainy season, but in October was found to compose about 80 per cent. of the blow-fly population, although owing to the intense and dry heat no strikes were recorded in the shearing sheds. *Chrysomyia rufifacies* was not abundant in October, but was expected to become the dominant species in summer. Further south, it was found that *Calliphora nociva* is always at least 40 times as numerous as *L. cuprina*, but that the latter is responsible for almost twice as many strikes. It is thought possible that *L. cuprina* is attracted mainly by sheep, and *Calliphora nociva* by traps [*cf.* preceding paper].

Minning (W.). **Beiträge zur Systematik und Morphologie der Zeckengattung** *Boophilus* **Curtice.** [Contributions to the Classification and Morphology of the Tick Genus *Boophilus*.]—*Z. Parasitenk.* **7** no. 1 pp. 1–43, 34 figs., 54 refs. Berlin, 18th September 1934.

In this revision, the author divides the genus into the subgenera *Boophilus*, s. str., *Palpoboophilus*, n., and *Uroboophilus*, n. Keys are given to the adults, and 10 new species and 2 new subspecies are described. The geographical distribution of the genus is indicated on a sketch map. *Boophilus* s. str. is confined to the Holarctic and *Palpoboophilus* to the Ethiopian regions, while *Uroboophilus* occurs in the Oriental, Ethiopian, Neotropical and Australian regions.

[Gitel'zon (I. I.).] **Гительзон (И. И). Die Hautleishmaniose (Orientbeule).** [Dermal Leishmaniasis (Oriental Sore).] [*In Russian.*]—Demy 8vo, 364 pp., 54 figs., 16 pp. refs. Ashkhabad, GesundhAmt. Volkskomm., 1933. Price 5 *rub.* 50 *kop.* ; binding 1 *rub.* 50 *kop.* [Recd. October 1934.]

This monograph on dermal leishmaniasis is based on the literature and on clinical investigations made by the author in Turkmenistan during his work as a doctor there for over 8 years. The subjects discussed include : general information on the disease, its history and its geographical distribution in the world and particularly in Central Asia ; the various species of *Leishmania* and their biological interrelations ; and the history of the discovery of *L. tropica* as the causal agent of dermal leishmaniasis, its morphology and biology. In two chapters (pp. 64–90), published literature on the relation of *Phlebotomus* to the

disease and on its possible reservoirs is reviewed, and one (pp. 198–215) deals with other forms of leishmaniasis. A section of 82 pages is devoted to various clinical forms of dermal leishmaniasis, 70 pages to therapeutics, and 33 pages to prophylaxis.

[Olenev (N. O.).] **Оленев (Н. О.). The Parasitic Ticks, Ixodoidea, of the Fauna of the U.S.S.R.** [*In Russian.*]—*Tab. anal. Faune U.R.S.S.* no. 4, 125 pp., 83 figs. Leningrad, Izd. Akad. Nauk SSSR [Pub. Acad. Sci. USSR], 1931. Price 2 *rub.* [Recd. October 1934.]

This handbook deals with the 8 genera and 61 species and subspecies of ticks that had been recorded in the Russian Union up to 1931. In the first part (pp. 3–50), general information is given on the classification of ticks, their economic importance and the history of their study in the Russian Union. Their morphology, biology and ecology are discussed, and the species occurring in the Russian Union are listed under their hosts. A separate chapter deals with the geographical distribution of the genera of ticks, and of the Russian species, and brief instructions are given for the examination of ticks and preparation of microscopic mounts.

In the second part (pp. 51–123), keys are given to the adults, larvae and nymphs of the families and the 8 Russian genera, and to the adults of the species, followed by descriptions of the latter, showing their hosts and distribution in the Russian Union.

Roberts (R. A.). **Some Insects collected in Mexico, mostly in association with Man and Animals or animal Products.**—*J. N. Y. ent. Soc.* **42** no. 3 pp. 249–262, 2 refs. New York, September 1934.

Most of the insects collected during a tour of Central Mexico from San Luis Potosi to Tampico in 1931 were Diptera, together with their associated insects, collected from meat baits, animals and animal excreta. The other Arthropods taken included *Menopon gallinae*, L., on the heads of fowls, *Cimex lectularius*, L., *Pulex irritans*, L., and *Ctenocephalides* (*Ctenocephalus*) *felis*, Bch., feeding on man, *C. felis* and *Rhipicephalus sanguineus*, Latr., on dogs, and *Amblyomma cayennense*, F., on man, horses, dogs and fowls. At San Luis Potosi, the most numerous blow-flies were *Calliphora latifrons*, Hough, and *Lucilia sericata*, Mg., and at Victoria and Tampico, *Cochliomyia macellaria*, F., *L. caeruleiviridis*, Macq. (*australis*, Tns.) and *Synthesiomyia nudiseta*, Wulp. Two parasites of blow-fly larvae, *Brachymeria fonscolombei*, Duf. and *Aspicera* sp., were obtained, and *Aphaereta muscae*, Ashm., a pupal parasite, was reared from human excrement infested with Dipterous larvae.

Mazza (S.) & others. **Investigaciones sobre la enfermedad de Chagas. I-II, I-IV.** [Investigations on Chagas' Disease. I-II, I-IV.]—*Publ. Misión Estud. Pat. reg. argent. Jujuy*, no. 16, 20 pp., 8 figs., 5 refs.; no. 17, 28 pp., 12 figs., 12 refs. Buenos Aires, 1934.

Papers in each of these two series record instances of the finding of *Triatoma infestans*, Klug, infected with *Trypanosoma* (*Schizotrypanum*) *cruzi*, in houses in Argentina where cases of Chagas' disease had

occurred. The first series contains first records of the disease in the province of Santiago del Estero, and the second includes records from the province of Jujuy of dogs and a cat infected with *T. cruzi*.

Hase (A.). **Zur Frage der Bettwanzenbekämpfung durch sogenannte biologische Verfahren.** [On the Question of the Control of Bed-bugs by so-called Biological Methods.]—*Naturwissenschaften* **18** no. 1 p. 23. Berlin, 3rd January 1930.

Hase (A.). **Bekämpfung der Bettwanze durch die Spinne** *Thanatos flavidus*. [Control of the Bed-bug by the Spider, *Thanatus* (*Thanatos*) *flavidus*.]—*Op. cit.* **21** no. 15 p. 285, 1 fig. 14th April 1933.

Hase (A.). **Ueber eine erfolgreiche biologische Wanzenbekämpfung durch die Spinne :** *Thanatos flavidus*. [Successful Biological Control of Bugs by *T. flavidus*.]—*Op. cit.* **22** no. 38 pp. 649–650. 21st September 1934.

In view of the fact that in Greece *Thanatus flavidus*, Simon, has been found to be predacious on *Cimex lectularius*, L. [*cf. R.A.E.*, B **18** 181], the author carried out investigations in Berlin on the value of this spider in the control of the bug. In August 1933 and February 1934, he introduced 39 spiders into 2 rooms infested with bed-bugs, in which were cages containing cats and small rodents and which, in spite of efforts to keep them clean, were being continually re-infested from other animals brought in. The spiders were not interfered with, and the rooms were used as before. By 10th August 1934, practically all the bugs had disappeared. A somewhat cursory examination revealed 20 nests of the spider. As the bugs diminished, the spiders began to prey on flies. They were actually seen devouring both bugs and flies.

Melvin (R.). **Incubation Period of Eggs of certain Muscoid Flies at different constant Temperatures.**—*Ann. ent. Soc. Amer.* **27** no. 3 pp. 406–410, 1 fig., 11 refs. Columbus, Ohio, September 1934.

Experiments on the effect of temperature upon the hatching of the eggs of Muscoid flies, the technique of which is described, showed that both high and low temperatures prolong the incubation period. The eggs of *Musca domestica*, L., *Cochliomyia macellaria*, F., *Phormia regina*, Mg., and *Lucilia cuprina*, Wied, hatched at 104°F., but those of *L. sericata*, Mg., *L. mexicana*, Macq. (*unicolor*, Tns.), *L. caeruleiviridis*, Macq. (*australis*, Tns.), *Lyperosia* (*Haematobia*) *irritans*, L., and *Stomoxys calcitrans*, L., failed to hatch. A figure gives the time-temperature curves and the reciprocals of them for the eggs of *P. regina*, *M. domestica* and *C. macellaria*. The reciprocals are S-shaped, and it is doubtful if they could be used to determine zeros for computing temperature summations.

Peter (—) & Gaehtgens (—). **Ueber den serologischen Nachweis der Dassellarveninfektion beim Rind und beim Menschen.** [On the Serological Proof of Ox Warble Infestation in Cattle and Man.]—*Zbl. Bakt.* (1 Orig.) **132** no. 1–2 pp. 81–90, 9 refs. Jena, 2nd July 1934.

Experiments showed that treatment of rabbits with an aqueous extract of larvae of the warble-fly [*Hypoderma*] produces specific antibodies, the presence of which can be proved by antigens. In the same way specific antibodies can be determined in the serum of infested

cattle [*cf. R.A.E.*, B **18** 66], a negative result being obtained with the sera of calves that could not have been infested. The antibodies were found in all young cattle that had been exposed to infestation and had warble tumours, but in the case of old warble-free animals the serological reactions were positive in some cases and negative in others. In the latter it could not be established whether antibodies had ever existed. The reactions with antigens, therefore, may be used as a proof of an infestation but not of an immunity acquired naturally.

In comparative tests with an extract of larvae of the horse bot-fly, *Gastrophilus intestinalis*, DeG. (*equi*, Cl.), the sera of cattle attacked by *Hypoderma* and of normal cattle gave, irregularly, negative or weakly positive results.

The serum of a child infested by *Hypoderma* gave a very definite reaction to the warble antigen.

Smirnov (E.) & Wladimirow (M.). **Studien über die Vermehrungsfähigkeit der Pteromalide** *Mormoniella vitripennis* **Wlk.** [Studies on the Capacity for Increase in *M. vitripennis*.]—*Z. wiss. Zool.* **145** no. 4 pp. 507–522, 2 figs., 12 refs. Leipzig, September 1934.

This work deals with the question of production of progeny of *Mormoniella vitripennis*, Wlk., in connection with the species and abundance of its hosts, the hosts used in the laboratory being *Calliphora erythrocephala*, Mg., *Lucilia caesar*, L., *Phormia terrae-novae*, R.-D. (*groenlandica*, Zett.) and *Musca domestica*, L. The abundance of progeny was greatest with the first named [*cf. R.A.E.*, B **22** 166, 216]. Tables are given showing the production of adults of the Pteromalid per host pupa. Parasitism of *P. terrae-novae* was more frequent than that of *C. erythrocephala*, since the former pupates on the surface of the ground and the latter in the soil, where it escapes the parasite. This explains why *M. vitripennis* is not suitable for use against sheep maggot flies [*cf. R.A.E.*, B **16** 198 ; **18** 157, etc.]. In an experiment, it failed to reach pupae of *C. erythrocephala* under sand barely 1 mm. deep.

de Buck (A.) & Swellengrebel (N. H.). **Behaviour of Dutch** *Anopheles atroparvus* **and** *messeae* **in Winter under artificial Conditions.**—*Riv. Malariol.* **13** no. 4 pp. 404–416, 4 refs. Rome, 1934. (With a Summary in Italian.)

The experiments described were undertaken to determine the effect of keeping females of the two races of *Anopheles maculipennis*, Mg., that are common in Holland, under artificial conditions during the winter season [*cf. R.A.E.*, B **21** 173]. When they were kept without nourishment at low temperatures from October to March, 59 per cent. of race *messeae*, Flni., survived but only 5 per cent. of race *atroparvus*, van Thiel. Sexual reactivation in both races was brought about by exposure to high temperatures (80°F.), high humidity (90 per cent.) and " enforced " feeding (feeding induced by confining them in small glass jars separated from the human skin by a gauze cover), even in October when the food requirements of *atroparvus* are still considerable and the difference between this race and the consistently fasting *messeae* is most marked. On the other hand, in October the proportion of reactivated females was greater in *messeae* (12 in 26) than in *atroparvus* (7 in 51). In November, January and February there was

practically no difference between the two races, but the length of time and the number of blood meals required to induce oviposition progressively decreased from 25 days and 6 blood meals in October, to 21–22 and 5 in November, 12–13 and 3–4 in January, and 5–7 and 1–2 in February. The greater proportion of reactivated females of *atroparvus* in November can probably be explained by assuming that *messeae* is handicapped somewhat by its anomalous blood digestion [*cf.* **20** 194]. Further observations showed that this phenomenon became less and less evident as the number of enforced feeds increased and as the winter season progressed. In the first half of February, although 81 per cent. showed anomalous digestion after the first blood meal, all showed normal digestion after the second. Moreover, the number showing anomalous digestion after the first meal was reduced to 43 per cent. in the second half of February and to 1 per cent. in March. Experiments in September-November likewise showed that repeated blood meals not only reduce the number of females suffering from anomalous digestion but also the length of the period that this lasts. In reared examples of *A. maculipennis maculipennis* (*typicus*) from both Holland and Italy blood taken in winter was digested normally.

Corradetti (A.). **Sulle modalità dell'accoppiamento dell'***Anopheles maculipennis atroparvus*. [On the Manner of Pairing in *A. maculipennis atroparvus*.]—*Riv. Malariol.* **13** no. 4 pp. 417–422, 1 fig., 5 refs. Rome, 1934. (With a Summary in English.)

Of the races of *Anopheles maculipennis*, Mg., that occur in Italy [*R.A.E.*, B **22** 137], only *atroparvus*, van Thiel, is stenogamic. The sexual behaviour and mode of pairing of this race in captivity are described. The males did not remain motionless on the walls or ceiling of the cage, but were in continual movement, their flight having a vigorous rhythmic motion with little actual displacement. From time to time, one or more males left the swarm to fly to a female. This behaviour was also seen in stables in Ferrara. In cages, it constitutes a decidedly distinctive character differentiating *atroparvus* from other Italian races, the males of which remain motionless like the females.

Consoli (N.). **La lotta contro la malaria in Sicilia durante l'anno 1932 e l'azione svolta dal Provveditorato alle Opere.** [Antimalarial Work in Sicily in 1932.]—*Riv. Malariol.* **13** no. 4 pp. 487–530, 16 pls. Rome, 1934. (With a Summary in French.)

An account is given of the measures successfully taken in 1932 against malaria in Sicily. They included dusting against Anopheline larvae with 425 tons of a mixture containing Paris green, oiling, the provision of numerous drainage channels and the filling up of depressions, and breeding of *Gambusia*.

De Benedetti (A.). **La campagna antimalarica del Comune di Milano negli anni 1931–33.** [The antimalarial Campaign in the Municipality of Milan in 1931–33.]—*Riv. Malariol.* **13** no. 4 pp. 531–538. Rome, 1934. (With a Summary in French.)

Reports for the first two of the three years here dealt with have already been noticed [*R.A.E.*, B **21** 115 ; **22** 98]. About 5 per cent.

of the Anophelines in this area were found to belong to the typical race of *Anopheles maculipennis*, Mg., and the remainder to race *messeae*, Flni. For applying Paris green against the larvae, a carrier impregnated with oil [**21** 180; **22** 138] was exclusively used. In 1930 there were 65 primary cases of malaria; in 1933 only 6.

ROULE (S.). **Rôle des poissons larvivores dans la prophylaxie du paludisme.**—(Thèse) Med. 8vo [8] 61 pp., 2 pp. refs. Paris, E. Le François, 1934.

This review of the value in the control of malaria of fish that destroy mosquito larvae includes a brief account of the disease, the mosquitos by which it is carried and the conditions prevailing in their breeding-places. The fish are classified according to whether they feed on the bottom or surface of shallow water, or in deep water. The morphological and biological characters governing larvivorous tendencies in different families of fish are discussed. These characters are most marked among the Poeciliids, which include the species of the genus *Gambusia*, the bionomics of which are discussed. These are the most hardy and voracious of larvivorous fish, adapting themselves to all geographical conditions and types of physical phenomena of pond life, and succumbing only to very prolonged cold. In localities in which mosquito larvae are protected by aquatic plants it is not possible to exterminate them solely by means of *Gambusia*, but where these fish can move about freely in the water malaria has in many cases disappeared as the result of their introduction. The great advantage of the use of *Gambusia* is that it is easy and its cost is low. The best results are obtained when it is combined with the use of chemical larvicides, which are required at the beginning of the season and become less and less necessary as the fish increase.

RUSSELL (P. F.). **Malaria and *Anopheles* Reconnaissance in the Philippines, II.**—*Philipp. J. Sci.* **54** no. 1 pp. 43–59, 1 pl., 7 refs. Manila, May 1934.

Further work on the incidence of malaria in the Philippines confirms the conclusions reached in the previous report [*R.A.E.*, B **21** 50]. Malaria appears to be more closely associated with *Anopheles minimus* var. *flavirostris*, Ludl., than with any other species, even of the same group. *A. barbirostris*, Wulp, which was often found in association with *A. minimus* var. *flavirostris*, was also frequently taken in malarious localities, but as it has never been recorded as infected in nature, it does not appear to be of importance in transmission. A list is given of the Anopheline larvae obtained in 1933, showing the localities and types of breeding-places in which they were collected. They included *A. aitkeni* var. *bengalensis*, Puri, an undescribed variety of this species, *A. kolambuganensis*, Baisas, and an undescribed species. Certain larvae that have been recorded as *A. umbrosus*, Theo., are apparently larvae of *A. baezai*, Gater [**22** 103], a species not hitherto recorded from the Philippines.

RUSSELL (P. F.). **Lectures on Malaria Prophylaxis and Mosquito Control (Revised).**—54 pp., 3 pp. refs. Manila, Bur. Hlth, 1934.

This bulletin consists of a series of lectures, based on the literature and on the author's experience, dealing in a concise and systematic

form with the prevention of malaria transmission by all possible means. It is meant primarily to give health officers and others interested in the subject the most important facts regarding malaria prophylaxis and mosquito control and concludes with practical suggestions for use in devising an effective malaria control campaign in the Philippines.

GASCHEN (H.). **Infection naturelle de *Anopheles hyrcanus* var. *sinensis* (Wied. 1828) et la transmission du paludisme au Tonkin.**—*Bull. Soc. méd.-chir. Indochine* **12** no. 6 pp. 554–557, 1 fig., 12 refs. Hanoi, 1934.

Sporozoites were found in 1 out of 118 females of *Anopheles hyrcanus* var. *sinensis*, Wied., collected on the Chinese frontier in the Province of Lao-kay, Tonkin. This Anopheline has previously been recorded as infected with malaria in Cochin China, but not in Tonkin.

WILLE (J.). **Estudio entomológico de la Epidemia del Paludismo en los Valles de la Convención y Lares (Dept. del Cuzco).** [An entomological Study of the Epidemic of Malaria in the Convención and Lares Valleys in the Department of Cuzco.]—*Bol. Direcc. Agric. Ganad. Peru* **3** no. 11–12 pp. 303–322, 15 figs., 4 maps. Lima, 1933. [Recd. October 1934.]

In a survey of the Convención and Lares valleys, Peru, *Anopheles pseudopunctipennis*, Theo., was the only Anopheline found, though some time previously *A. argyritarsis*, R-D., had been recorded there. The adults of *A. pseudopunctipennis* did not occur indoors during or soon after heavy rain, which prevented flight from the breeding-places and swept the larvae out of the latter. They were not found by day in huts loosely built of bamboos, but were taken in dwellings of stone or sun-dried brick, from which they could not escape so easily. It is probable that they oviposit repeatedly, with intervening blood-meals obtained in dwellings. Examples infected with malaria were taken, but the number dissected was too small to establish a reliable percentage of infection. The maximum number of matured eggs in a female that had had only one blood-meal was 97. The larvae were found in marshes and pools, generally in clear water with algae, especially *Spirogyra*, and sometimes with aquatic plants such as *Lemna*. The water was either stagnant or nearly so. Various types of breeding-places are described.

HOLDAWAY (F. G.) & MULHEARN (C. R.). **Field Observations on Weather Stain and Blowfly Strike of Sheep with special Reference to Body Strike.**—*Pamphl. Coun. sci. industr. Res. Aust.* no. 48, 35 pp., 7 figs., 20 refs. Melbourne, 1934.

Blow-flies usually attack sheep in the breech, on the prepuce, on the head or in wounds, strikes in wool on other parts of the body being less common and only seriously prevalent at intervals of several years. They were, however, numerous in many parts of New South Wales in the autumn of 1931, when excessive rains and generally humid conditions resulted in the wool being kept wet for long periods. As body strikes are not complicated by the presence of urine, faeces or particular predisposing lesions, they were studied in the field with a view to determining the possible relationship between characteristics

of the wool and susceptibility to attack [*cf. R.A.E.*, B **21** 57]. Observations were made on 12,859 sheep from pure-bred Merino flocks in the north and cross-bred Merinos in the south. All abnormal conditions of the wool due to bacterial infection are referred to as weather stain. In almost all body-struck sheep examined, evidence of weather stain was found, and in the few cases in which it was not observed, it is probable that the stained wool had been removed when the sheep were treated for strike. However, there was a higher incidence of stain than of strike in all flocks and occasionally a high incidence of stain without any recorded strike. Weather stain is apparently associated with yellow wool yolk, and there was an increase in the proportion of sheep stained as the average colour of the wool of the flock changed from white to yellow. In each flock, the struck sheep had darker coloured wool yolk than the unstained sheep, but there was no significant difference in yolk colour between the former and the stained but unstruck sheep. In the pure-bred Merinos the amount of staining increased with the density of the wool, whereas in the southern flocks the percentage of staining was high but did not appear to be correlated with wool density. In one of the latter flocks exposed to the same conditions as the others, a considerably lower proportion was stained, but this flock had the lightest coloured yolk, and this, or the factor producing it, was apparently responsible. Only one flock in the north showed sufficient body-strike to warrant conclusions, the percentages struck being 4, 10 and 16 in the slack, medium and dense wool groups, respectively. An inverse relation to wool density appeared to hold good in the south, but as there were no differences in the amount of stain in the three wool classes nor any agreement between the percentages of stain and strike, it would appear that other factors were involved.

Yellow colour in the wool yolk appears to be identical with what has been called " golden coloration," which is due to a pigment (lanaurin) excreted in the sweat. There seems, therefore, to be a correlation between the depth of coloration and the proportion of sweat solids present in the yolk ; thus sweat content is an index of susceptibility. In Merinos with dense wool the number of sweat glands per unit area is particularly high, and, on account of the thicker covering, the glands would be expected to be more active. Thus the higher degree of stain and strike in dense wools may be associated with a higher proportion of sweat. In pure Merinos the dense wools were darker than the slack. On the other hand, yolk colour does not always indicate susceptibility, so that there must be some other factor involved in addition to the proportion of sweat. It is suggested that this may be the grease fraction, for some sheep with dark yolk but low susceptibility possess very greasy wool, whereas others with a lighter yolk that have proved susceptible have harsh, non-greasy wool.

Data on breech conformation [*cf.* **19** 224] in unstained, stained and body struck sheep suggested that there was a tendency for plainness of crutch to be associated with lack of stain on the body and wrinkles of crutch to be associated with susceptibility to body strike.

FULLER (M. E.). **The Insect Inhabitants of Carrion : A Study in Animal Ecology.**—*Bull. Coun. sci. industr. Res. Aust.* no. 82, 62 pp., 1 pl., 2 figs., 65 refs. Melbourne, 1934.

When the Section of Blowfly Research of the Division of Economic Entomology was formed in 1928, a plan of research was outlined that

included studies on the factors influencing the susceptibility of sheep to blow-fly strike [see preceding paper] and on the ecology of carrion insects both in Europe [*cf. R.A.E.*, B **18** 273] and in Australia. A very detailed account of the observations and experiments carried out on the latter project in Australia during 4½ years is given in the present paper. A list is given of the insects associated with carrion at Canberra, where most of the work was carried out, and of those of importance in other parts of Australia, together with notes on the principal species of Diptera, Coleoptera and Hymenoptera. The seasonal distribution of blow-flies and fluctuations in their abundance are dealt with as a preliminary to a discussion of ecological succession, which includes descriptions of experiments showing the nature of the successions in the different seasons. The part played by competition both intra- and inter-specific is considered at length.

The following is taken from the author's summary and conclusions : Each stage of decomposition in a carcass is characterised by a particular group of insects, and succession is closely related to competition, earlier occupants being driven out by others. The outstanding fact resulting from the work is that competition between the larvae is the main factor regulating the general blow-fly population. The numbers of adults of any species present are more than sufficient to provide a carcass with the number of larvae that it can support, and actually several species occupy it. Consequently there is intense competition between the larvae for food and space, and the population of emerging adults is primarily determined by the amount of carrion available. The proportion of a primary species in the total population is determined by a number of factors, such as intra-specific competition, which reduces the size and number of individuals, competition with other primary flies, which intensifies the effect of intra-specific competition, and competition with secondary flies and the attacks of predators, which reduce the number without affecting the size. The destruction of blow-fly eggs and larvae by predators reduces competition in that generation, but the destruction of prepupae and puparia (acting after competition has produced its effect) influences the number of adults that will emerge and thus affects the intensity of competition in the next generation. Thus the indirect effect of parasites and predators is rather favourable than otherwise, although they have a direct effect on the relative proportions of the various species of blow-flies comprising the total population. Weather limits the seasonal occurrence of the different blow-flies, but when they can occur it does not directly influence the numbers present in any area, although it appears to do so by influencing activity. It also affects the larval environment, increasing competition by accelerating decomposition or causing rapid drying, or decreasing competition under certain conditions by rendering dried carcasses sufficiently moist to be suitable once more for larval development. Thus the total effect of all factors, other than competition, only influences the blow-fly population by reducing or increasing competition. There is no evidence that they ever reduce the numbers to a point at which competition no longer occurs and so themselves become a primary influence.

From an economic point of view, these investigations have shown that a natural enemy, to be of value in limiting the blow-fly population as a whole, must itself be the primary factor affecting abundance, and no such insect is known. The numbers of a particular species might be reduced by this means, but only a natural enemy of a primary

species should be used, otherwise by reducing secondary species it would favour an increase in the primary species. As mortality in adult flies reduces competition among the larvae of surviving flies, the efficiency of trapping is lessened ; if trapping is to be carried out, baits in a suitable stage of decomposition to attract primary flies should be used. Destruction of carcasses intensifies competition but is difficult to carry out efficiently under Australian conditions [*cf.* **20** 259].

BHATIA (H. L.). **The Bot Flies of Goats and Sheep.**—*Agric. Live-Stk India* **4** pt. 5 pp. 516–523, 2 pls., 10 refs. Delhi, September 1934.

Although *Hypoderma lineatum*, Vill., sometimes attacks goats [*R.A.E.*, A **22** 152], *H. crossi*, Patton, is the species chiefly responsible for very heavy losses to the goat skin industry in India, where its incidence is mainly restricted to the hilly districts [**14** 150]. A brief account is given of its bionomics, and the adult, larva and pupa are described. The eggs have not been observed, but it is believed that they are laid in the long hairs on the sides of the host. Very young larvae have been seen in small warbles on goats in July and August, and full-grown ones are encountered from November to the middle of January. When mature, the larvae leave the warbles through the orifices, drop to the ground and pupate in crevices within 2–7 days.

Sheep in India are attacked by *Oestrus ovis*, L., which also sometimes attacks goats. A short account is given of its life-history, and control measures employed against it and against *Hypoderma* spp. in cattle in other countries are briefly discussed from the literature.

MORRIS (J. P. A.). **Ectoparasites.**—*Rep. Dep. Anim. Hlth N. Rhod. 1933* p. 19. Livingstone, 1934.

The Arthropod parasites of domestic animals here recorded as observed in Northern Rhodesia in 1933 are all included among those noticed from the previous year's report [*R.A.E.*, B **21** 277].

COOLEY (R. A.). **A Search for Tick Parasites in South Africa.**—*Onderstepoort J. vet. Sci.* **3** no. 1 pp. 23–42, 27 refs. Pretoria, July 1934.

A detailed account is given of an expedition to South Africa undertaken by the author between 4th June and 17th October 1928 to obtain information on the parasites of ticks [*cf. R.A.E.*, B **18** 163]. A list is given of all the ticks collected, showing their hosts and the date and place of collection. Out of 260 lots, 13 were parasitised by *Hunterellus hookeri*, How. (*Ixodiphagus caucurtei*, du Buysson), the only parasite found, the species attacked being *Hyalomma aegyptium*, L., *Rhipicephalus oculatus*, Neum., *R. evertsi*, Neum., *R. appendiculatus*, Neum., an unidentified species of *Rhipicephalus* and one of *Hyalomma*. All the parasitised ticks were in the nymphal stage and were taken on hares (*Lepus zuluensis*) between 9th June and 30th September. Eight females of the parasite, adults of which had never previously been observed in nature, were found in the fur of a hare that had recently been shot.

Nieschulz (O.), Bedford (G. A. H.) & du Toit (R. M.). **Results of a Mosquito Survey at Onderstepoort during the Summer 1931–32 in Connection with the Transmission of Horsesickness.**—*Onderstepoort J. vet. Sci.* **3** no. 1 pp. 43–77, 8 figs. Pretoria, July 1934.

This paper is one of a series dealing with work on the transmission of horse-sickness and blue-tongue of sheep, both of which are non-contagious virus diseases and have a similar distribution in South Africa. Experiments on the transmission of blue-tongue by mosquitos have already been noticed [*R.A.E.*, B **22** 171].

The occurrence of horse-sickness is normally restricted to the summer, and the severity of an outbreak depends mainly on the amount of rainfall. Horses kept in screened stables at night escape infection, even in areas where the disease is prevalent. These facts suggest that mosquitos are involved in the transmission of the disease [*cf.* **18** 243]. In order to ascertain the species likely to be concerned, a mosquito survey was carried out during the summer months of 1931–32 at Onderstepoort, a locality where horse-sickness had been prevalent in former years. A total of 24 species out of the 47 recorded from Onderstepoort were taken, either as adults in traps baited with a horse or as larvae in breeding-places or both. It was found that the traps failed to give an accurate indication of the relative abundance of the species in the field, and, as this was the main object of their use, work with them was discontinued. Unfortunately the season was very dry, only a few cases of horse-sickness occurred and mosquito breeding-places were restricted. Details are given of the breeding-places and breeding habits of some of the mosquitos collected.

From the results of the survey the following conclusions were reached: Anophelines may be connected with transmission, their scarcity during the season indicating their dependence on rain. As very few Anophelines were found, information on the probable species involved could not be obtained, though it is unlikely that malaria vectors would be concerned, owing to their house-haunting habits. A number of species of *Aëdes* would fit in with the epidemiology of the disease. Most of them depend on rainfall and breed only in temporary pools, so that their numerical abundance is proportionate to the amount of rain. *A. caballus*, Theo., *A. lineatopennis*, Ludl., and *A. hirsutus*, Theo., would be the most likely species to act as vectors, the first two, which remain throughout their lives near their breeding-places in the vleis, coinciding most accurately with the epidemiology of the disease. *A. vittatus*, Big., *A. nigeriensis*, Theo., *A. durbanensis*, Theo., and *A. dentatus*, Theo., must be regarded as potential vectors of secondary importance. These species are all fairly widely distributed over Africa. *Mucidus scatophagoides*, Theo., which contrary to statements in the literature is a voracious blood-sucker, must be regarded a potential carrier equal in importance to *A. caballus* and *A. lineatopennis*. It is unlikely that species of *Culex* are vectors, as they frequently breed in permanent waters; moreover, the most numerous of the species of this genus are not restricted to the summer months.

Nieschulz (O.) & du Toit (R. M.). **Handling Mosquitos for Experimental Purposes under South African Conditions.**—*Onderstepoort J. vet. Sci.* **3** no. 1 pp. 79–95, 5 figs. Pretoria, July 1934.

In the course of experiments on the transmission of horse-sickness and blue-tongue of sheep [*cf.* preceding paper], it was found necessary

to evolve methods for rearing mosquitos, feeding them on experimental animals and keeping them alive in South Africa, where adverse climatic conditions, particularly the low humidity, proved to be the most important obstacle. As previous experience on this subject was of little real value, the methods had to be worked out from the beginning, and a somewhat detailed account of observations and results is given as a guide for future workers. The paper is divided into four sections, the first of which deals with the catching of adult and larval mosquitos. The second gives the methods used for keeping mosquitos alive in the laboratory and includes a description of a rack holding two tiers of cages in which a high humidity was maintained by running water on to the metal top of the rack, allowing it to soak the hessian with which the rack was covered and draining the excess away by means of gutters round the base. Methods of feeding mosquitos on horses are described in the third section, which also shows the arrangements for attaching cages to the horses by means of elastic bands attached to a girth or by inserting them in holes in a specially constructed metal saddle. Details are given of a special insect-proof stable in which the horse is prevented from lying down and a high humidity is maintained by means of walls of hessian kept wet in a manner similar to that used for the cages. When feeding mosquitos on sheep, the subject of the last section, the cages were held in position by tapes tied to locks of wool [*cf. R.A.E.* B **22** 171], and sufficient moisture was supplied by covering the tops of the cages with damp cotton-wool held in position by the same tapes.

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Biron (M.). **Etude de l'immunité des chenilles de** *Galleria mellonella* **envers les différents types de bacilles tuberculeux.**—*Ann. Inst. Pasteur* **53** no. 4 pp. 404–417, 1 pl., 4 figs. Paris, October 1934.

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*For relation to disease see under Blue-tongue, Dengue, Encephalomyelitis (Equine), Fièvre Rouge, Filariasis, Herpes, Horse-sickness, Leprosy, Malaria, Poliomyelitis, Poultry Typhus and Yellow Fever.

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